

COMPLEX ACTION METHODOLOGY FOR ENTERPRISE SYSTEMS (CAMES):
AN EXPERIMENTAL ACTION RESEARCH INQUIRY INTO COMMUNICATIVE
ACTION AND QUANTUM MECHANICS FOR ACTION RESEARCH FIELD STUDIES IN
ORGANISATIONAL CONTEXT

Thesis submitted in accordance with the requirements of the University of
Liverpool for the degree of Doctor of Business Administration

by
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7 September 2018

Declaration Of Own Work

I, Olaf Cames, declare that the thesis entitled ' COMPLEX ACTION METHODOLOGY FOR ENTERPRISE SYSTEMS (CAMES): AN EXPERIMENTAL ACTION RESEARCH INQUIRY INTO COMMUNICATIVE ACTION AND QUANTUM MECHANICS FOR ACTION RESEARCH FIELD STUDIES IN ORGANISATIONAL CONTEXT ' and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

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- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
- where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
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Abstract

Current action research methodologies bias observations severely and render quantification models of subjective data uncertain. Thus, this research thesis aims to design a scientifically rigorous action-science methodology process that establishes a subject-bias-free method for communication in an organisational context. This investigation aims to apply scientific rigour to this issue and to verify the general applicability of mathematical formalism of quantum mechanics to address organisational venture that includes a “wicked problem” (Stubbart, 1987, quoted in Pearson and Clair, 1998, p. 62) of how to communicate and collaborate appropriately.

The subjective data collection and quantification models of this thesis build on the quantitative formalism of quantum mechanics and qualitative formalism of the theory of communicative action. Mathematical and ontological formalism combine into a novel research strategy with planned instrumentation for action research field studies summarised under the term ‘Complex Action Methodology for Enterprise Systems’ (CAMES).

The outcome is a process to understand the behavioural action of organisational members. This process is not technical, and neither does it involve a machine or apparatus. The process is primarily mathematical and requires that participants act under a new identity, a virtual identity. Similarly, the data analysis does not require a specific machine, technology or an apparatus. A spreadsheet calculator will primarily be sufficient for low entry. Data collection occurs in one block with an average duration time of 10 minutes in a virtual location.

The practice can, therefore, use this thesis’ procedures for bias-free quantification of subjective data and prediction of an individual’s future behaviour with certainty. Prediction of an individual’s future behaviour with certainty provides to the organizational practice what organisational practice lacks but urgently requires. The certainty that claimed findings of behaviour in organisational context requires to intervene and steer. Certainty and justification for planned intervening and steering initiatives secure funding.

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Chapter 1: Introduction

1.1 Motivation and Purpose

The background of this thesis is that current action research methodologies bias observations severely and render quantification models of subjective data uncertain.

1.2 The concepts of quantum mechanics and communicative action

The mathematical framework of quantum mechanics formulises the process of reasoning based on interaction the law of nature provides.

1.2.1 Naturally arising mathematical reasoning

Hilbert spaces and interferences are naturally arising from mathematical and physical phenomena (He and Niyogi, 2004). The mathematical framework of quantum mechanics utilises the theory of separable Hilbert spaces to measure interferences and predict interference phenomena to occur in their natural habitat. The theory of separable Hilbert spaces assumes that all states can be projected and geometrically evidenced without the need of prior empirical observation (Hassard, 1991). Detection of interferences is expected given its natural arising. Interference measures quantify, measured quanta result in scale and scale transforms quantification into qualitative statements according to scale. The measures of interference represent expected definitions of pure states representing healthy, standard, and natural emerging conditions (Von Neumann, 1933). Measurable deviations from pure state definitions of naturally arising interferences include absence or degrading of interference, indicate bias in measuring interferences and biases resulting in loss of fully exposed quantum behaviour (Aerts, Broekaert and Smets, 1999). Mathematical evidenced incompatibilities between idealised expected pure states according to the interference scale and measured observables result in evidence of biasing influence and are represented as statistical mixtures of pure states. Mixed states are entangled states which reveal specific statistical correlations. Thus, known statistical correlations lead to experimentally verifiable interferences distinguishing incompatible observables from their quantifiable bias. Different interference measures result in differentiation of normal and significant biasing input. Hilbert spaces combine multi-dimensional vector spaces with exact measurements according to calculus. This logic provides the mathematical framework upon which valid conclusions are drawn, resulting in bias-free quantification models of subjective data specific.

Conventional theories define interferences as noise. Declaration of noise and disturbances are errors which introduce interference, instead of measuring and explaining them. Thus, a research design lacking consideration of the naturally arising phenomena of interference and Hilbert spaces induce bias and additional interference in measuring and analysis rendering the claimed findings of the observations biased (Yukalov and Sornette, 2011; Busemeyer, Wang and Lambert-Mogiliansky, 2009; Aerts, 2009b)

1.2.2 The quantum logic substitutes Boolean assumption of thought processes

Quantum logic substitutes the limiting measure of 0 and 1 in Boolean logic with measures traversing between 0 and 1, resulting in algebraic expression of its negation and contradictory, a.k.a. Superposition. Quantum operations conclude on the assumption that thought processes are non-commutative, therefore changing the order of quantum operations changes the thought process results and vice versa changes thought processes in the non-commutative interference pattern of quantum logic. Both, algebraic expressed contradictory thought processes and qualitative changes in thought processes based on non-commutativity permit parallel, simultaneous consideration of observable and hidden biasing thought processes.

1.2.3 The quantum reversible logic substitutes irreversible set operations in Boolean algebra

Quantum operands feed outputs from prior or parallel thought trajectories into the input of its negation and contradictory, in no-time. No-time is defined as either earlier or current or later thought trajectories that make up the quantum parallelism of always present potentialities.

Boolean set operations and logical operations are restricted to logically irreversible connections of AND, OR and NOT. Logical connectives AND, OR, and NOT are logically irreversible resulting in incapability to determine unique inputs for all outputs preventing inferring a unique input for each output (Williams, 2011).

Quantum trajectories are reversible. Reversible logic permits persistent association of unique inputs/outputs resulting in no-erasure of information during quantum mathematical

reasoning. The reversible quantum logic permits forwards and backwards run of trajectories until the most probable answer to a research question is verifiably identified.

1.2.4 Prevent bias in large communication settings

The quantum model executes on the logical representation of data, rather than on physical connections to data. A quantum model runs as a visual specification of quantum operation. Thus, algebraic expression in Dirac notation transforms into executable code on quantum computers.

Porting quantum logic models into executable code on the quantum computer serve the goal to detect and evaluate all potentialities of bias in large communication settings.

Quantum models executing Hilbert space operations on quantum computer hardware utilising twenty superconducting artificial atoms draw a verifiable conclusion about a real-world exposed bias as but one of 1048576 possible associated thought processes one may choose to reason, in no-time. This permits action research with up to 400 parallel research questions (variables) and longitudinal action research field studies targeting bias-free communication in large organisations or cities. During 2019 new quantum computer hardware become commercially available utilising fifty superconducting artificial atoms permitting 125 quadrillion trajectories considering up to 2500 research questions (variables) to easily find the most probable biasing trajectory. This allows action research field studies to target bias-free communication on acglobal scale.

1.2.5 Quantum cognition is unmediated and undiminished by distance

Operations performed in quantum models utilising separate Hilbert spaces affect each other.

A given, separate Hilbert space A affects another, separate Hilbert space B. The operation and results of entanglement between data representations in Hilbert space A and Hilbert space B cannot be reproduced nor explained as a direct product state subset A and state in a complementary subset B by utilising set theory, or Boolean logic. This quantum logic is based on the fact that it causes entanglement. Classical logic, classical set theory, and Boolean algebra are limited to permutation matrices, lacking the notion of entanglement entirely.

The quantum model is based on unitary matrices and unitary operators evolve state. The evolved state presents a snapshot of evolving entanglement. Thus, the representation of

unitary matrices encompass the process reversibly from input into state and from the state into output via Schrödinger's equation. Hilbert space host both, the input and the output on the subatomic scale.

This permits methodological experimentation for the discovery of observed, automated biases and identification of the hidden, most potent bias. Experimental mapping of unbiased input into maximally biased output quantify as entanglement within the state. Experimental picking of initially unentangled input characterise how significant this input compared to the entangled average bias output. The more effective the experimentally chosen and initially unentangled input is on the biased entangled output, the higher the biasing power of the entangled experimental input (Zanardi, Zalka, and Faoro, 2000).

Researcher bias is measurably minimised in quantum cognitive science as the methodology is not perturbed by acting. Researcher experimental influence is restricted on measures at earlier stages in Hilbert spaces vs acting on the actually observed target (Atmanspacher, Römer and Wallach, 2002; Wang et al., 2018b). The classical methodology requires a read of control bits to decide on the path of action — this interference results in biased observation. Controlled quantum experimentation issues controlled quantum acts by measuring superposition of all control actions in parallel therefore not acting on the target directly while covering the whole in no-time. Measured bias commensurate naturally with the amplitude of the control state within the input superposition state. The quantitative measure identifies input state averages and identifies the significant input associated with the maximum entanglement state between two Hilbert spaces. This transformation maps state into its concurrent phase shift. This process does not execute in isolated separate Hilbert spaces but on the entangled state of two Hilbert spaces, each consisting of separate Hilbert spaces. Thus, the observation of entanglement is that it is not led by a priori developed quantum model. Follow up procedures create the missing unitary matrices model and another, the additional procedure creates the circuit required to run the quantum model repeatedly.

This controlled quantum experimentation permits to measure and identify biasing associations, executes control actions not introducing bias on the target of evaluation,

observes entangled biases, extracts the underlying unitary matrices model for reversible logic and hands over the self-generated circuit to quantum engineers for repeated execution and finetuning of claimed findings (Shende, Markov and Bullock, 2004; Zhang et al., 2003).

Classical methodologies use irreversible algebra, lack the concept of entanglement and superposition entirely and run on conventional computers based on irreversible logic gates hardcoded in their chip design.

1.2.6 The concepts of the theory of communicative action

The theory of communicative action separates the structures of speech organisation from structures of actions, thus exposing a similarity of characteristics and suggesting structural resemblance within the Hilbert space. Structures of the organisation of speech and structures of action resemble the subordinate structures of separate Hilbert spaces. Thus, allowing action research logistics of a shared context in Hilbert space modelling. Separate Hilbert spaces model of structures of speech organisation and structures of action entangle in observable speech acts, therefore, they holistically represent an entangled state of communicative action, separate, partial and altogether present simultaneously (Lawless and Schwartz, 2002).

The theory of communicative action defines a hierarchy of pathological and distorted communicative action as well as an “ideal speech situation”. Thus, establishing definitions of pure state. The latter creating the ideal for a pure, unpolluted, uncontaminated state of coercion and bias-free communication. The former establishing pure states of biasing interferences to the truth (Habermas, 1987a), sincerity (Habermas, 1987b; Chomsky, 1957), and normative rightness (Habermas, 1987a; 1987b).

$$TI_{(ST)} = \cos \left(\frac{qbi_{(01)}}{2} \right) |0 + e^{qbi_{(01)}} \sin \left(\frac{qbi_{(01)}}{2} \right) |1$$

$$TI_{(ST)} = \cos \left(\frac{qbi_{(02)}}{2} \right) |0 + e^{qbi_{(02)}} \sin \left(\frac{qbi_{(02)}}{2} \right) |1$$

Equation 1 Entangled bias measure

Both, action theory higher dimensions of sense-making in communicative action and lower dimensional theory of quantum mechanics meet by sharing variables. The theory of communicative action arbitrary pure states of ideal speech and pathological and distorted communicative action enter as weight contributions values $q_{bi}(01)$ and $q_{bi}(02)$ (figure 1; figure 2) to the controlled quantum experimentation resulting in a verifiable measure of biasing associations or their absence. This controlled quantum experimentation avoids irreversible Boolean logic and prevents otherwise biased analytics towards Boolean poles of 0 or 1 (Williams, 2011).

1.3 The concept of plausibility

Action research defines plausibility as an action involving testing. Two forms of tests involve specific actions, both targeting a proposed course of action. To prove plausibility one of the two tests needs to be sufficient. The first action tests the reaction on the idea of the proposed course of action, without actually processing the proposed course of action. Plausibility is evident if either acceptance by stakeholders and peers is achieved without resistance or by choosing an alternate course of action aimed to eliminate the thread that sanctions of managers never execute the proposed course of action. The second form of the test involves taking action. Plausibility is achieved by apparent processing of the proposed course of action evidencing the validity and credibility of the proposed course of action by researching the process (University of Liverpool, 2017; Herr and Anderson, 2014; Ramsey, no date).

This thesis plausibility testing covers the two tests and three testing plausibility phases. These include a course of action based on acceptance by senior management, an alternate course of action independent of managerial approval, researching the process of the action within and across different departments, researching the process of action on internet social media, and by researching the process of action on IBM's superconducting quantum computers.

1.4 Action Science

Action research defines quality criteria for the interplay between theory and practice in social sciences. Theories evaluate practicality. If a theory proves practical in a real-life situation, the theory becomes a theory of action. Conversely, if a theory of action proves to solve a problem in a real-world scenario, the theory of action becomes a theory of practice for action research field studies. Traditional action research, as postulated between 1930 and 1950, left this process of theory testing and theory development to experimental exploration (Easterby-Smith, Thorpe and Jackson, 2012; Greenwood and Levin, 2006; Lewin, 1945; 1948). During the last two decades of the 20th-century, management science implemented a methodological approach to action research theory testing and theory development resulting in practical learning methodologies for organisations. This methodological approach is known as action science (Easterby-Smith, Thorpe and Jackson, 2012; Coghlan and Brannick, 2012).

Action science verifies if a theory qualifies as a theory of action. A theory of action resulting in a complete understanding of data in social structures verifies as a theory of action research. Action science uses theories of action as building blocks to develop a planned approach for interventionists to steer problematic social structures in the desired direction (Dutton and Ashford, 1993). Theories of action resulting in less or no understanding of social structures are of less or no utility in action research. Such theories of action with little or no understanding of social structures are supposed to be eliminated from further consideration as a building block for methodology development as those are of less or no help to intervene and of less or no help to solve problems in real-world situations. Continuing reflection of whether theories of action utilised in action research still represent the best understanding of social processes is a crucial factor in developing knowledge. Knowledge about social processes is a critical factor for success or failure of action research intervention initiatives and solving problems in real-world situations (Reason and Bradbury, 2008; Easterby-Smith, Thorpe and Jackson, 2012). Action Science knowledge production has behavioural aspects. Conversations and behaviour qualify as action science data. Socio-linguistic analysis and social interaction in an action context are fundamental action science methodologies aimed to produce status quo changes in action context and via research texts.

Action Science is predictive as it starts with analysing the effects of the action, resulting in theory and knowledge building for practice (Laskey, 2006; Russell et al., 2003). Management Science confirms that organisational risk management benefits from the collection of subjective data and that measuring degrees of beliefs will provide risk mitigation and risk reduction opportunities (Williams, 2002). Such efforts are critical if decisions are crucial and the probability distribution is small. Action science developed general principles for collection and quantification of subjective data during the 1980s. However, a management science review of such methodologies in the first decade of the 21st century considered researcher bias on observations as severe and reason to dismiss such quantification models (Williams, 2002; Merkhofer, 1987; Kahneman, 2012; Hammond, Keeney and Raiffa, 1998). Action science argumentation is centrally concerned with the critically-reviewed instrumentation of intervention. The most recent update to action science was during the last two decades of the 20th century (Easterby-Smith, Thorpe and Jackson, 2012; Greenwood and Levin, 2006; Coghlan and Brannick, 2012; Reason and Bradbury, 2008).

This thesis reviews 21st century scientific research in decision science, psychology, and critical theory that resulted in theories of action claiming a more complete understanding of data in social structures for conceptual combination (Aerts, 2009), perception (Atmanspacher, Filk and Römer, 2004), judgments (Khrennikov, 1999), disjunction effect (Busemeyer and Bruza, 2012), conjunction fallacy (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008), and liar paradox (Aerts, Broekaert and Smets, 1999). Those theories have been verified in their utility to understand behaviour in laboratory setups and thought experiments. An action science approach is required verifying if this understanding confirms in a practical context in real-life environments.

1.5 The foci and boundary for this research

The research question is if action research can practically utilise the conceptual framework of quantum mechanics in action research field studies for bias-free behavioural data collection and quantification. This research question is tied to verification if action research can practically utilise the theory of communicative action to contextualise the quantification

with pathological and distorted behavioural pattern. Firstly, existing theory and practice in academic research and practitioner studies in the field of critical theory, action research, decision sciences and management science reviewed. Secondly, the empirical case for RQ1, RQ2, RQ3 and RQ4 obtains data for evaluation of practicality. The empirical study focuses on project managers, due to the project-focused environment in the company from which data is collected. Thirdly, an analysis of experimental results seeks evidence of claimed findings. Finally, findings are related to discussions in academic literature around both theories with particular attention to research instrumentation strategies.

The conceptual frameworks of communicative action and quantum mechanics, the associated objectives and researchers' 36 years organisational management practice experience set the foci and boundary for this research.

RQ1: If the theory of quantum mechanics and the theory of communicative actions provide an understanding of human behaviour.
RQ2: If the theory of quantum mechanics and the theory of communicative action qualifies as a building block for a planned methodological approach to intervene and steer problematic social structures in the desired direction.
RQ3: If action research can practically utilise the conceptual framework of quantum mechanics in action research field studies. The research question is tied to verification if researcher bias on observation can be detected.
RQ4: If action research can practically utilise the conceptual framework of quantum mechanics and theory of communicative in action research field studies to reduce researcher bias on observation.

1.6 The concept of plausibility in action research

Action research translates ideas and academic theories by transforming discussions in academic literature into action. Action research identifies plausibility of ideas and academic theories by empirical evidence of practitioner acceptance or rejection to a proposed course of action and by researching the process of acting. Both plausibility, the reaction of a practitioner confronted with the idea and theory and the process analysis of executing the translated academic theory in practice, evidence testing plausibility in work context. The

ability to test the academic theory in the work context increases the quality of plausibility. The empirical evidence gathered qualify and modify academic theories and select the most reasonable and probable discussions around the idea tested in a work context (University of Liverpool, 2017; Ramsey, no date).

1.7 Aim

This thesis aims to design a scientific rigour action-science methodology for a subject-bias-free communication in an organisational context that is operational for action researchers and practitioners attributable to human behaviour in organisational contexts.

Chapter 2: Literature Review

2.1 Introduction

The literature review compares existing theory and practice and analyses academic research and practitioner studies in the field of critical theory, action science, decision sciences and management sciences, to establish and maintain organisational, communicative competence. Methodologies are reviewed across different disciplines to decide on scientific rigour, formalism, and mathematical procedures have proven to explain human behaviour in an organisational context.

The purpose of the review is to determine practitioner and scientists' current knowledge, distil decisive influences, and synthesise theoretical and methodological findings into a novel approach to practically utilise the theory of quantum mechanics and the theory of communicative actions for a bias-free understanding of human behaviour in organisational contexts that provide certainty for claimed findings.

2.2 General principles for bias-free research strategies

Influences by the researcher and interaction of measuring research instrumentation on the observed result in methodological flaws, false measures and incomplete interpretation of data. Biased research renders observations unreliable and invalidates data gathered from such biased observations. A practical research design combining bias-free quantitative instrumentation with qualitative reviews during the next round of “meta-cycle of inquiry” (Coghlan and Brannick, 2012) is practical. Researcher utilising validated instruments on observations produce meaningful findings (Miles, Huberman and Saldana, 2013).

Instrumentation that either measure or reduce or avoid biasing effects are validated instruments. Qualifying research instrumentation as bias-free research instrumentation requires validation procedures for the quantitative instrumentation deployed.

Every research strategies reviewed in cognitive and decision sciences literature apply the conceptual framework of the theory of quantum mechanics to social phenomena and claim to have achieved an understanding of such phenomena due to prior instrumentation in their research design. Some research instrumentation reviewed in cognitive and decision sciences claim bias-free certainty for their findings (Windridge and Nagarajan, 2017; Dzhafarov et al., 2016).

Cognitive and decision science instrumentation reviewed either use the theory of quantum mechanics unchanged or use slight modifications for so-called quantum-like or quantum structured or weak force instrumentation outside of physics. Quantum-like categorises provide quantum mechanics measurement in social sciences (Khrennikov, 2010). Quantum structure provides data models for cognitive experiments with conventional theories (Aerts, 2009; Bruza and Abramsky, 2017). Weak force measures the effect of human interaction on the measuring process (Atmanspacher, Römer and Wallach, 2002). All have in common that modifications of prior published instrumentation predominantly establish just a switch from previously published research context to the new research question context while keeping similar mathematical procedures unchanged.

Research strategies in decision sciences have in common that researcher impact and interaction of research instrumentation is of concern. Uniform across all reviewed instrumentation research designs is the concern of biases introduced by researcher effects

on research and by the effects of the research instrumentation on the researcher. The former is addressed by prior instrumentation the latter by verification procedures for claimed findings. The result is that particular cognitive and decision sciences research design produce generalities addressing the issue of bias-free collection and quantification of subjective data in a planned, methodological manner.

Generalities found practical for a mixed methods quantitative and qualitative action research design are prior instrumentation for stabilizing configurations (Windridge and Nagarajan, 2017; Aïmeur et al, 2013), two-state vector formalism (Atmanspacher, Filk and Römer, 2004; Wang et al., 2018a; Aharonov and Vaidman, 2008; Ashtiani and Azgomi, 2016), alterations of problems into higher dimensions (Wang and Busemeyer, 2013; Aerts, Broekaert and Smets, 1999), limiting the number of different states that research participants can be in (Wang and Busemeyer, 2013; Aerts, Broekaert and Smets, 1999), and initial measurement followed by planned interferences (Wang et al. 2018a; Wang and Busemeyer, 2013; Yukalov and Sornette, 2011; Kronz, 2008; Busemeyer and Bruza, 2012; Aharonov and Vaidman, 2008; Busemeyer, Wang and Lambert-Mogiliansky, 2009).

Review of discussions in academic literature particular confirm RQ1, RQ3 and RQ4 as plausible.

Researcher's conclusion is to follow the unifying patterns across reviewed cognition and decision sciences and considers an action research approach with planned instrumentation. Generalities considered are initial measurement followed by planned interferences via a 2-state vector formalism and limiting the number of different states that research participants. All considerations are candidates for experimental proof of practicality.

2.3 General principles for quantification of subjective data

Research reviewed provide generalities for planned instrumentation to measure human behaviour with certainty.

Researcher's efficiency and appropriateness assessment for analytical procedures measuring human behaviour in quantitative and qualitative research methodologies considered social sciences (Haven and Khrennikov, 2013), finances (Khrennikov, 2010; Schaden, 2002), game theory (Piotrowski and Śładkowski, 2003), decision sciences (Busemeyer and Bruza, 2012; Busemeyer, Wang and Lambert-Mogiliansky, 2009), cognitive science (Trueblood and Busemeyer, 2011), psychology (Aerts and Aerts, 1997), marketing (Choustova, 2007), genetics and economy (Accardi, Khrennikov and Ohya, 2008; Baaquie, 2007; Khrennikov, 2009). The unifying interdisciplinary schema for quantification of subjective data is the interference pattern.

The interference pattern proved successful to explain data in research aimed to understand behavioural paradoxes. Novel analytical routines and corresponding formal logic had been successfully applied to explain observed human behavioural reasoning phenomena not entirely explainable with traditional concepts (Busemeyer et al. 2009; Wang et al., 2018a).

The interference effect is defined in quantum theory as measurable and predictable and is expected to be there, naturally occurring. The presence of interference indicates quantum behaviour. Measured interference represents a healthy, standard, natural emerging and measurable condition (Von Neumann, 1933). The disappearance of interference indicates loss of fully exposed quantum behaviour (Aerts, Broekaert and Smets, 1999). Again, a naturally occurring and measurable phenomena (Aharonov and Vaidman, 2008).

Interference defines as noise and disturbance in conventional theories. Interference violates conventional theories basic assumptions and renders methodologies based on such conventional theories inadequate for further investigation of interferences (Conte et al., 2007).

Explanations for data resulting in understanding of human behaviour by utilising interference pattern render other methods treating the interference phenomena as noise and annoying factor inoperable for further interference pattern processing, thus for bias-free quantification of subjective data and prediction of an individual's future behaviour.

further consideration. A satisfactory explanation by using the conceptual framework of the theory of quantum mechanics is direct evidence for the flaws in the theory of total probability. Conservative, mainstream methodologies for an explanation of human behaviour base on the flawed theory of the law of total probability and apply methodologies based on the flawed assumption, e.g. all Markov property based methodologies (Wang and Busemeyer, 2013; Wang et al., 2018a).

Relevant for the research questions is that measures and predictive analytics applying the conventional framework of quantum mechanics explain complete human behavioural phenomena (Aerts and de Bianchi, 2015). Review of clinical, experimental research informed about comparison studies applying both theories that resulted in more complete understanding for human behavioural phenomena like conceptual combination (Aerts, 2009), perception (Atmanspacher, Filk and Römer, 2004; Conte et al., 2009), judgments (Khrennikov, 1999), disjunction effect (Busemeyer and Bruza, 2012), conjunction fallacy (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008), liar paradox (Aerts, Broekaert and Smets, 1999) and contexts and meanings (Yukalov and Sornette, 2011). Those experimental studies expose failing, traditional, classic methodologies, their incomplete explanation of data and their classifications of phenomena as researcher induced methodological flaws. Flawed methodologies apply conventional, standard Markov observation techniques. Such introduced interference instead of measuring and explaining them. It is the conventional mainstream research design that prevents complete interpretation of subjective data and introduces researcher induced interference in measuring and analysis that renders the claimed findings biased (Yukalov and Sornette, 2011; Busemeyer, Wang and Lambert-Mogiliansky, 2009; Aerts, 2009b)

Across non-physics disciplines like social sciences, finances, game theory, decision sciences, cognitive science, psychology, genetics, medicine and economy, empirical validity and evidence for claimed findings emerge naturally by application of quantum structured interference pattern. The conceptual framework of quantum mechanics provides logical steps and proof with certainty for claimed contextual influences (Denolf, 2017), emerging behavioural dynamics (Aerts and de Bianchi, 2014), the presence of interference (Yukalov

and Sornette, 2011), and the degree of entanglement with biasing environmental factors (Masuch, 1985; Bruza, et al. 2009).

Reviewed research in mathematical psychology informed about attempts to apply advanced conceptual frameworks based on the theory of quantum mechanics like the quantum field theory (de Barros, Montemayor and Assis, 2017). Suitability of such attempts to apply sense-making for higher dimensions requires further exploration if quantum theory mathematics proofs practical to explain socio-emotional contexts (Busemeyer and Bruza, 2012).

2.4 General principles for predicting human behaviour with certainty

The unifying interdisciplinary schema for quantification of subjective data is the interference pattern. A review of literature of attempts to perfect the research design for collection and quantification of subjective did not result in evidence that action research practically utilised the conceptual framework of quantum mechanics in action research field studies. General principles for predicting human behaviour with certainty necessitate experimental proof of practicality.

Research reviewed establish general principles for translation of behavioural research question into logical steps (Zhang and Dzhamfarov, 2016). Behaviour measures in two dimensions. One dimension is the researcher's hypothesised research question. The other dimension is the time dimension. Both dimensions are subject to the interference pattern (Cramer, 2001). Interference pattern applies to both measures.

Some studies reviewed modify this approach. The number of research questions entering quantum mechanics equations at once increases to four. Increase in research question increases precision and confidence in claimed prediction by increasing the number of data points to four. The four data points fill a four-dimensional Hilbert space. A Hilbert space is a mathematical expression of a naturally arising mathematical and physical phenomena. The four research questions enter as four-dimensional vector and return as precise measure and visuals transformed back into three-dimensional Euclidean space (Busemeyer, Wang and Lambert-Mogiliansky, 2009).

Other studies establish a strict formalism. Research question enters the Hilbert space as a shared variable. The variable shares between the research context and internal rules

dominating the Hilbert space. The context is the behaviour of the individual. The individual is assumed to have choices on how to act and behave. The research question limits the options to two choices representing hypothesis and 0-hypothesis (Zhang and Dzhamalov, 2016). This individual is in a superposition between those two possibilities and has to decide what behavioural options to pick. The decision conflict is measurable as interference (Yukalov and Sornette, 2011). The Interference pattern applies.

Only a few research strategies extend to validate bias-free instrumentations. Such validation procedures verify if the instrumentation interacts with the individual. At the time of the researcher's analysis, two measures execute. One measure establishes the verdict for the bias-free or biasing interaction of researcher. Measures validate if the individual is in a natural condition of deciding. The natural condition is the superposition condition. In case the individual is still in a superposition condition the conflict exposes as measurable interference (Aerts, Broekaert and Smets, 1999). The Interference pattern applies (Wang et al., 2018).

The other measure validates if the behaviour of the individual meets desired behaviour. All research instrumentation outlined constitute intention modelling. A prediction of future behaviour based on preferences for intention to act and behave (Bisconti et al., 2014).

Review of discussions in academic literature particular confirm RQ1, RQ2, RQ3 and RQ4 as plausible.

Researcher considers intention modelling as a candidate for experimental proof for its practicality. In case experimental proof is positive the hypotheses of research questions RQ1, RQ2, RQ3 and RQ4 confirm.

The researcher does not consider the theory of quantum mechanics for alterations of problems into higher dimensions. Researcher considers the theory of communicative action to provide sense-making for alterations of problems into higher dimensions.

2.5 Practical, emancipatory and technical principles for collecting and quantification of behaviour in an organisational context

Collection and quantification of behaviour in an organisational context result in sense-making knowledge gains (Weick, 1988). The literature reviewed argue that empirical-analytical knowledge gains pair with research interests (Habermas, 1972). Research interests are therefore never separated from the subject investigated (Herr and Anderson, 2014). Claims for bias-free instrumentation require precise positioning of the researcher to his research interest.

Interpretative methodologies achieve a more complete understanding. A mixed interpretative methodology applies combined quantitative and qualitative methodologies into organisational and work context (Creswell, 2013). The theory of quantum mechanics provides mathematical-analytical orientation for interpretation in lower dimensions of atomic research questions. This interpretation satisfies the objectivist claim that an understanding requires empirical evidence and logical steps, combined into interpretative methodologies (Herr and Anderson, 2014).

The theory of communicative action augments the understanding of human behaviour through a higher dimensional interpretation of sense-making. Those interpretations serve the research interest of practicality. The sense-making hermeneutic interpretation through the theory of communicative action serves the goal of more complete understanding, therefore, contribute to practicality.

Researcher's interest is to utilise such understanding and transform the gained knowledge into control over the social realm. Control over the social realm is a technical interest.

Researcher's particular work situation of Organisational management practice and organisations utilising Information technology for communicative action require integration in already existing technical controls. Control over the social realm serves the emancipatory commitment of the researcher for change and investigation of power structures within an organisation (Habermas, 1972; Collins, 1997).

Power structures expose in behaviour. Observable behaviour in organisational context is an individual's attitude, desire and need by observing organisational participant communicative actions expressing intentions, dispositions, feelings and beliefs (Habermas, 1990; Chandon,

Morwitz and Reinartz, 2005; Hintikka, 1961, cited in Elster, 1983). Specific formations of observable behaviour in organisational context interact according to patterns.

Organisational sciences identify behaviour indicating power structure patterns as power laws, e.g. power-law of formation of “vicious circles of mediocrity” (Masuch, 1985).

Habermasian pragmatic categories of systematically distorted communication indicate the presence of organisational sciences’ power laws, e.g. can an ordinary interpersonal situation of speaking/acting indicate an abstract system of rules identifying the power law of silenced victims exposed by their observable decline or by their refusal to shift to discourse (Gross, 2010).

2.6 Associate quantitative and qualitative interpretative methodologies

The intelligible human behaviour is detectable primarily via human language. Language appears in speech acts. Speech acts embed in actions and interactions. Discourse analysis requires analysis of speech acts and a second, differentiated, isolated analysis of behaviour in action and interaction. By establishing this separation between speech and action, structures of behaviours separate in structures of speech and separate structures of action and interaction (Habermas, 2002; Hettel, Flender and Barros, 2008). As both structures appear at once in real-world observations is a methodological, logical approach placing any observable into subordinate separable Hilbert spaces, well fitting. Habermasian separation of structures of speech organisation and structures of actions/interactions expose affinity to subordinate separable Hilbert spaces research logistics (Lawless and Schwartz, 2002). Both, the separation of structures of speech organisation and the separation of structures of actions/interactions describe the entangled state of communicative action, separate, partial and all together simultaneously.

Habermasian claims that distorted communications and coercive power structures are dominant in real-world communications (Adams, 1996). This adverse effect of coercive power actions on communication and other Habermasian pathological communication deficiencies affecting the organisation of speech are methodological detectable in observed speech acts (Habermas, 1987a; Searle and Vanderveken, 1985).

Habermasian claims for entanglement between structures in the organisation of speech and structures of communicative action logistically fit the conceptual framework of the theory of quantum mechanics approach to separate states in distinct vectors of Hilbert space. Vector states of the organisation of speech separate from vector states of communicative action. Combining both is context of entanglement procedures utilised in the theory of separable Hilbert spaces (Prugovecki, 1981). Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) logistically separates structures in the organisation of speech from structures of communicative action. Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) establishes new structures in the organisation of speech. By observing organisational communication, the communicative action inside of new changed organisation of speech an individual’s behaviour receives a dedicated focus (Habermas 2002; 1987a). This dedicated focus of an individual’s behaviour enters as a new domain into the mathematical formalism of quantum mechanics (von Weizsaecker, cited in Habermas, 1973).

This statement for an overdue mixed interpretative methodology by introducing other domains than physics into the theory of quantum mechanics refocus the literature review (von Weizsaecker, cited in Habermas, 1973). One dedicated focus in the theory of communicative action is the influence of coercive power on Habermasian categories of truth (Habermas, 1987a), sincerity (Habermas, 1987b; Chomsky, 1957), and normative rightness (Habermas, 1987a; 1987b). Coercive power is observable in actions/interactions in the organisation of speech. An observable is transferrable into one or more than one research question. The research questions enter the conceptual framework of quantum mechanics as shared variables. Shared between the higher level sense-making dimensions of coercive power and the lower level mathematical-logical Hilbert space dimensions of “truth” and “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012). The union of both, the hidden ontological and the observable empirical dimensions convert into a new pattern for an understanding of intelligible human action (Kaku and O’Keefe, 1994).

Habermasian principles, e.g. that speech organisation itself is coercion-free, that formal and universal logic of speech organisation are initial conditions before one can participate in the organisational action, that speech organisation formalities are context independent and universally applicable develop theoretical and primarily non-empirical evidenced theory

constructs (Jones, 1986; Hassard, 1991). Habermas formalism describes the state as ontological. Corresponding to the assumptions from the theory of quantum mechanics that Hilbert spaces and interferences are “naturally arising” (He and Niyogi, 2004) mathematical and physical phenomena do Habermasian categories assume naturally arising of interferences to truth (Habermas, 1987a), sincerity (Habermas, 1987b; Chomsky, 1957), and normative rightness (Habermas, 1987a; 1987b) and group such interferences in a hierarchy of pathological and distorted behaviour.

Habermas definition of “ideal speech” and “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) is formal and includes conditions inside of such ontological formalities. In a Habermasian ideal speech situation, no constraints exist, and everyone is permitted to present arguments, object, augment, justify his/her position under the condition and obligation to show true intentions (Habermas, 2002). Transformation of an ideal speech into IT Praxis formalities require resemblances of Habermasian principles into meeting sessions:

- “• Presupposition 1: In case controversial validity claims do occur in organisations must such controversial validity claims are thematised in an all organisational participants including session (Smith and Cames, 2016; Habermas, 2014).
- Presupposition 2: No one will be excluded from sessions or restricted from contributing to a controversial validity claim (Smith and Cames, 2016; Habermas, 2014).
- Presupposition 3: Every session participant has equal rights to engage in communication (Smith and Cames, 2016; Habermas, 2014).
- Presupposition 4: Every session participant must have the same technical controls available providing the opportunity to speak to the matter at hand, e.g. the technical controls initiating a CAMES session about controversial validity claims and contributing during such a controversial validity claim (Smith and Cames, 2016; Habermas, 2014).
- Presupposition 5: Any detected deception and illusion of organisational participants will become subject of CAMES session and transformations according to goals 1-10 aimed to enforce participants to express their articulations again but now by using help and assistance

by CAMES to articulate a clear meaning to their sentences (Smith and Cames, 2016; Habermas, 2014).

- Presupposition 6: CAMES communication will be observed, traced and tracked in order to detect coercion and ensure elimination of restrictions tracked and traced via surveillance of anonymised organisational communication utilising electronic communication or digitised audio recordings of meetings.” (Smith and Cames, 2016; Habermas, 2014).

Those formalities establish healthy and expose pathological, and distorted communicative action (Habermas, 1987a; 1987b). Distorted communication is observable. Observable communicative competency deficiencies in the organisation of speech are missing regulations on how to articulate questions, answers, objections, admittance, missing formalities to embed, distribute speech acts, and missing regulations of topic deviations by speakers (Habermas, 2002; Habermas, 1987a; Axelrod, 1976).

Review of discussions in academic literature particular confirm RQ1 and RQ2 as plausible.

Researcher considers experimental proof for practicality for the claim that interferences to the truth, sincerity is measurable and result in “truth” or “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) determination expressible in quantum mechanical state description.

Researcher considers deductive mathematical-analytical proof for practicality that a translation of the theory of communicative action formalisms, notations and hierarchies for observables pathologies and distortions indicating interferences of truth, and sincerity into formalism, notations and hierarchies of the theory of quantum mechanics result in measures of their “truth” or “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) in quantum-like (Khrennikov, 2010), or quantum structure (Aerts, 2009) or weak force (Atmanspacher, Römer and Wallach, 2002) state notation.

2.7 Inquiry to layer Hilbert space into social groups in the theory of communicative action.

Habermas transforms his formal conditions into pragmatics (Habermas, 2022). Pragmatics are initial conditions. Those initial conditions are transformable into policies and procedures. Policies and procedures are adaptable in Practice.

In conjunction with mathematical, logical analytics from the theory of separate Hilbert spaces are Habermasian pragmatics pattern for notation of behaviour and action. Habermas' formal notations include pragmatics for "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) describing environmental parameters for distortion-free communication. This "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) provides an opportunity to establish an experimental environment.

Initial conditions, designed per Habermasian ideals, create a pure, unpolluted, uncontaminated state of coercion-free communication, as initial conditions for experimental validation procedures. Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) grounds on the concept of language games. His notation claims to capture the totality of all facts that expose in the boundary of language in pure cognitive language (Habermas, 2002). Habermas' "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) is the language game; his notation is the language to capture all facts in purely cognitive terms (Habermas, 1987a). The "ideal speech situations" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) is a theorem.

Habermasian theorems are logical arguments. Habermasian theorems recruit out of statements. Statements build axioms. Axioms introduce starting points for research questions. Research questions execute as a reasoning process open to other arguments. A Habermas' "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) is an axiom. Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) establish a language game (Habermas, 2002). The language game builds a constraint rule bounded environment to apply his notation to capture all facts (Habermas, 1987a). Other logical constructs, requiring mathematical proof for theorems, establish inside the language game for deductive proof of the hypothesis (Habermas, 1987a; 1990). This process augments experimental proof.

Any symbolic notation is transformable into mathematical symbols. Sequences of symbols represent repeatability. Anyone using the notation can perform reverse engineering by following the sequence in opposite order. Repeatability is a precursor for the development of pragmatic procedures for the practice. The Habermasian notation is pragmatic (Habermas, 2002).

An organisational practice equipped with practical, repeatable procedures for coercion free behaviour establish recommended practices to axiomatic proof mathematical theorems to understand, measure, prevent and countermeasure pathological and distorted behaviour in organisational context (Habermas, 2002). Mathematical proof of subjective factors contributing to behaviours like feelings, emotions, and biases, introduce the interference pattern as an argument for axiomatic proof in the boundaries of the Habermasian language game, a.k.a. “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990; Yukalov and Sornette, 2011).

Review of discussions in academic literature particular confirm RQ1 and RQ3 as plausible.

Researcher considers Habermasian language game, a.k.a. “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) and claimed ability to contain interference pattern for mathematical proof of subjective factors contributing to behaviours “like feelings, emotions, and biases” (Yukalov and Sornette, 2011) as a candidate for experimental proof for its practicality.

For this thesis research is a vehicle that combines language with a hypothesis proof practical as it provides to the work situation of researcher what’s lacking and urgently required. The organisational practice lacks certainty that claimed findings of behaviour require to intervene and steer. Intervening and steering behaviour in organisational context requires justification for funding and efforts.

Researcher considers “ideal speech” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) situations suitable for technical and emancipatory research interests. Technical and emancipatory methodology extension of this thesis primarily interpretative methodology considers “ideal speech” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) as a useful

intervention tool to steer social structures into a desired direction as soon as early warning signs of communicative abuse detect. Useful because of informing organisational members early enough, who are accountable to establish, keep and maintain the organisational competitive advantage, to immediately act to reduce the risk of seeing high performers cancelling their contracts or employment and before pathological communication patterns dominate and evolve into psychotic organisational cultures (Dechter, 2003; Masuch, 1985).

The suitability and appropriateness of the above thread elimination actions range from single intervention action like the firing of identified pathological communication reinforcer to enterprise-wide intervention initiatives in the organisation of speech to eliminate pathological communication reinforcement relations from reoccurring (Platt, 1973).

2.8 Quantum-like formalism provides intermediary conceptuality for organisational intervening initiatives

Intervention initiatives require short reaction laps between detection and reaction (Landry, 1995). Intervention initiatives require further to be justified. Both requirements satisfy by the verifiable certainty of quantitative behavioural measures for observed behaviour (Feldman and Lynch, 1988).

Intervention initiatives with short reaction time encompass ad hoc meeting invitation where real identities switch towards virtual identities executing a topic discussion under strict enforcement of Habermasian “ideal speech” principles (Habermas, 2002; Habermas, 1987a; Habermas, 1990).

Other intervention initiatives require extended research instrumentation. Those alternative intervention initiatives with extensive instrumentation automate monitoring (Jeffrey and Laurie, 1994). Automate surveillance of speech act, actions and interactions detecting any structure deviating from Habermasian the better argument wins communication pattern (Habermas, 2002). Such instrumentation serves action research ethics by taking control over the social realm and by investigating power structures for opportunities to emancipate individuals from coercion and habits (Herr and Anderson, 2014).

The justification for intervening and steering actions materialise if quantitative methodology procedures result in measures of concerns for behaviour in organisational context. Those

measures enter the realm of scientific rigour as quantum mechanical eigenstates in Hamiltonians of Hilbert space observed communicative actions. If values match patterns of pathologic or distorted communication in the theory of communicative action, then justify intervention initiatives given quantitative evidence with certainty (Habermas, 2002; Aerts, Broekaert and Smets, 1999). Detection of distorted communication is the detection of the mismanaged organisation of speech in practice (Habermas, 2002). The theory of quantum mechanics and the theory of communicative action build a block for a planned methodological approach to intervene and steer problematic social structures in the desired direction (Dutton and Ashford, 1993).

Review of discussions in academic literature particular confirm RQ1 and RQ2 as plausible.

Researcher considers deductive mathematical-analytical proof for extended research instrumentation for intervention initiatives with short reaction time.

2.9 Transform mathematical complexity into ontological simplicity

Habermas' "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) had been under critique of being counterfactual. Today's virtualised workspaces allow reconsiderations of "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) workspaces. Habermas notation transforms the complexity of 4-dimensional Hilbert space state expressions into ontological state simplifications. Interventionists receive shorthand notation to apply quantum-like formalism into intermediary conceptuality (Aerts, Broekaert and Smets, 1999).

Habermas' formal notation is a diagnostic framework in which communicative pathologies identify, localise, diagnose, and therapize (Rich and Craig, 2012). Habermas outlines these practical use cases in his formal normative pragmatics (Habermas, 2002). Habermas pragmatics reveal techniques to empirically evidence distorted communication patterns like speaker's actions and speaker intentionally introducing confusing mechanisms of deception (Habermas, 1987a). Speaker actions intentionally introducing confusing mechanisms are communicative actions in the context of observable behaviour.

Such human behavioural phenomena are subject of already existing and scientifically proven quantum-like quantitative procedures like behavioural anomaly detection in conceptual combination (Aerts, 2009), illusionary effects in human perception (Atmanspacher, Filk and Römer, 2004), disjunction effect (Busemeyer and Bruza, 2012), affinities to fall for conjunction fallacies (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008), biasing judgments (Khrennikov, 1999), and truth irritations by liar paradoxes (Aerts, Broekaert and Smets, 1999).

Empirical data for behavioural anomaly detection apply as values to non-local variables by observing interactions in context. As Habermasian notations are universally applicable across different action contexts, non-local validity for its findings is the logical consequence. In this sense, Habermasian pragmatics are universal (Habermas, 2002). Applying formalities of Habermasian pragmatics leads therefore to the identification of universal conditions. Those conditions are communicative pathological explanations. Universal applicability is claimed by quantum mechanics as well. Quantum cognitive sciences claim universal applicability because of mathematical procedures capable of projecting all possibilities with certainty into and out of naturally occurring Hilbert space and interference phenomena (Aerts and de Bianchi, 2014; Aerts and de Bianchi, 2015).

Applying Habermasian notations in conjunction with quantitative measures, therefore, results in new behavioural pathologies and re-interpretation of behavioural pathologies that had previously identified, localised, diagnosed and therapized (Lawless and Schwartz, 2002; Rich and Craig, 2012). Those results can only materialise if universal explanations and re-interpretation apply to a context.

Review of discussions in academic literature particular confirm RQ1, RQ3 and RQ4 as plausible.

Researcher considers experimental proof for practicality for the claim that empirical data for behavioural anomaly detection quantify according to existing and scientifically proven quantum-like procedures for behavioural anomaly detection.

Researcher considers deductive mathematical-analytical proof for the claimed transformation of 4-dimensional Hilbert space state expressions into ontological state simplifications.

2.10 Both theories connect to the same context

Both theories, the theory of quantum mechanics and the theory of communicative action, claim universality in approach and findings (Aerts and de Bianchi, 2015; Habermas, 1987a). Universality is time-independent from the occurrence of the context. Thus, even when either great distance or time-lapse separate explanations and re-interpretations, their universality is not affected. This independence from any spatiotemporal, space-time constraint results in post-metaphysical hidden states, exposing reason. In the context of human behaviour, action and interaction are those hidden states always present, revealing time-independent causality (Yukalov and Sornette, 2011; Habermas, 1987a).

Both theories base on universality (Aerts and de Bianchi, 2015; Habermas, 1987a). Both theories assume that deploying universality into experimentation will reveal the hidden ontology of the observed human behaviour (Conte et al., 2007; Habermas 2002). The assumption of an always present universal hidden truth that requires the proper instrumentation context is appealing. Relating an individual's behaviour to groups, subdividing behaviour according to similarities and differences reveal an individual's true ontology (Meindl, 1990).

The literature review revealed a mathematical-analytical procedure claiming to generate an individuals' behavioural inner dynamics via past-, vivid- and post- judgements (Wang et al., 2018b). Universality is claimed by generating missing data out of Hilbert space (Busemeyer, Wang and Lambert-Mogiliansky, 2009).

Review of discussions in academic literature particular confirm RQ1, RQ2 as plausible.

Researcher considers experimental proof for practicality and validity for claimed generation of missing data out of Hilbert space by transforming this mathematical-psychology

laboratory research design into an action research compliant field study instrumentation approach.

2.11 Contextualize the management issue as quantum mechanical variable

Generating an organisational member's behavioural inner dynamics by generating missing data out of Hilbert space saves cost, time and efforts. Cost, time and efforts are management key performance indicators (Marshall and Meckling, 1962). That organisational endeavours are not prosperous because of communication deficiencies, behavioural issues increase cost, time and efforts (The Standish Group International Inc., 2013; The Standish Group International Inc., 2015). Contextualize the behavioural issue as a quantum mechanical variable achieves cost, time and efforts decrease and is a management task.

The organisational management lacks procedures to determine or predict organisational member behaviour with certainty (Miles, Huberman and Saldana, 2013). Management science literature indicates awareness that behaviour can be tested and modified. Scientific knowledge of patterns is considered inaccurate. The value of such attempts is to provide additional input for an extra flanking route but not to solve the issue itself or solve the problem (Uhl-Bien, Marion and McKelvey, 2007).

Collecting and quantifying the interaction occurring by and through biased individuals is considered unsolvable. Behavioural inner dynamics of biased individuals for steering and intervening purposes is not measured (Caldwell, 2005). Attempts to pursue such knowledge gains label under tacit knowledge. Tacit knowledge is any knowledge an individual hold. Tacit knowledge is complicated and inaccessible. Tacit knowledge is the result of a complex, subjective weighting significance of interwoven and contradictory reasoning (Nightingale, 1998). Attempts to understand such reasoning faces weighing all possible environmental factors like aesthetic, social and economic factors resulting in messy data collection and data analysis and creating more problems than solving (Kash and Rycroft, 2002).

Approaches to launch a methodology capable of generating and responding to behaviours categorise as fractal systems attempt in organisational sciences literature (Arthur 1989, cited in Anderson, 1999). Fractal systems expose natural phenomena that are fractal. a.k.a. As attractors and performers in catastrophe theory (Wheatley, 2011; Guastello, 1995; 2007).

Fractal systems simulate naturally occurring phenomena. The outcome of such attempts states as questionable. Vague outcomes are predominantly action logistic and relearning of very specific and particular behaviours. Desirable behaviour state as sensitivity, vulnerability and responsiveness. Shared across all such systematic approaches is the necessity to include measures. Operational procedures for regular result check and integration of such repetitive procedures into organisational member work environment experiences are necessities. Actual outcomes and change initiatives limit to action learning and voluntary feedback sessions (Torbert, 1999).

Management science literature considers subjective data collection but primarily for a behavioural change. The process itself is subject of scientific rigour. Methodical efforts concentrate in achieving adherence to desired behavioural change intervention by integrating such as risk factor for profit generation. Threats and penalties by non-adherence to proposed other behaviours is deemed a successful operation to achieve instantaneous behavioural change (Masuch, 1985).

Management Science literature improves findings in complexity theories to achieve a more holistic understanding of the environmental complexity leading to attempts to substitute traditional organisational management tools with complexity management (Gul, 2002). Complexity management is a practitioner literature term that consumes metaphors like, dynamic, nonlinear, multicausal, self-organisation, cybernetics and interconnects such as other holistic oversimplifications like natural systems and artificial processes (Saynisch, 2010). Reviewed attempts in management literature to establish complexity formalism and complex quantitative models limit to forecast organisational effectiveness. Instead of behavioural factors is primarily technical uncertainty, and oversimplified analytical models in flat 2-dimensional arrays proclaimed as tools to address the issue of overly complicated organisations (Shenhar and Dvir, 1996).

The awareness that complexity exists, awaiting organisational management to act on, is not leading to articulation, formalism nor mathematical-analytical procedures that practitioner can utilise as actionable for the management of complexity (Maylor, Vidgen and Carver, 2008). Further, probability modelling of emerging possibilities, a typical problem in nonlinear interactions of complex adaptive systems, limit mathematical-analytical procedures to

analyse the linearity of organisational costs (Anderson, 1999; Palomo, Rios and Ruggeri, 2007). No probability modelling considers emerging possibilities of human behaviour in organisational context. Universal, general principles qualifying as validation procedures for claimed findings beyond and across local contexts do not exist.

Review of organisational sciences literature evidences an awareness and acknowledgement that human unpredictability embeds in complexity (Wheatley, 2011). Attempts to establish scientific rigour and methodological, analytical procedures for management of the surrounding complexity summarise under complex adaptive systematics and is common knowledge of business administration graduates (Maguire et al., 2006; Drummond, 2001; Anderson, 1999; Orton, 2000). Complex adaptive systems characterises by vague metaphoric terms expressing their observables vs their mathematical structures. Complex adaptive systems management characterise by their limiting scope. Data collection focus on non-linear interactions, modelling of such interactions result in schemata carried by agents, procedures for capturing the systematics of autonomous networks base on self-organization, observation of parallel evolution tracks lead to a critical mass of novelty, and finally recombine the unknown and simplification of the unstructured (Wang and von Tunzelmann, 2000; Anderson, 1999). The practicality of a complex adaptive systems management is not the subject of such attempts.

Practicality is the subject of computational simulation attempts reviewed primarily define data collection procedures of phenomena vs behavioural data collection of organisational members. Computational simulation attempts reviewed collect anything that appears as interacting elements of random events. Further ordering and grouping criteria to establish methodology beyond loose coupling of random events is not available in organisational sciences literature (Thorpe and Holt, 2008). The necessity to methodologically handle the observable emergence of the non-linear is confirmed across management science literature but has left out behaviour (Jaafari, 2004). The understanding of organisational member behaviour appears as mind mapping. Mind mapping appears impossible in case behaviour embeds in organisational realities exposing ill-structured and ill-defined hierarchies (Remington, 2016). Human behaviour labels emotional is not analysed further and applies in management science literature reviewed just as an indicator, an indicator of malfunction. Observable behaviour and attitudes categorise emotionally (The Standish Group

International Inc., 2015; 2013). Emotional is treated as a synonym to conflict and indicates that performance diminishing behaviour occurs in an organisational context (Pelled, Eisenhardt and Xin, 1999).

Review of discussions in academic organizational sciences and practitioner literature confirms particular adaptable solution for organisational management practice RQ1, RQ2, RQ as plausible.

Researcher considers deductive mathematical-analytical proof for the claimed computational simulation ability to analyse behaviour in the organisational context beyond the loose coupling of random events.

2.12 Translate the complexity into action

Management Science literature reviewed does not meet practicality demands in the researcher's work and organisational environment. A more complete understanding of human behaviour is not achieved. A versatile solution for organisational management practice requires practices addressing non-linear systematics in a manner that proofs practical in interpreting behaviour, establishes control of behaviour by technical controls, creates intervening opportunities to free organisations from behaviour creating coercion, and judgment of others without evidence (Bazerman and Moore, 2013).

One observable behaviour requiring interpretation, control and intervention to change is distorted, pathological communication leaving identifiable traces in enterprise organisational communications. Pathological distorted communication processes indicate power struggles between discourse protagonists as well as organisational power struggles (Gul, 2012).

Organisational power structures keep organisations struggling. The organisational managements continue utilising practices already known to be inadequate in addressing causal factors interacting non-linearly and persist in treating such as noise (Maguire et al., 2006). Structures applied by enterprise management methodologies are not scientific nor the result of formal scientific research. The result is an additional pattern of behaviour contributing to keep and increase the rate of non-prosperous organisations.

The continuing application and further distribution of patterns known to not helping organisational manager and practitioner in their efforts to address behavioural patterns result in the complexity of organisations. This behaviour is metastable behaviour.

Metastable behaviour prevents rearranging to preferred behaviour by establishing barriers (Fischer, 1993). Coercive power structures dominate in organisational communications indicated by keeping practices of distorted communications in the interest of protagonists and beneficiaries of the status quo (Adams, 1996). Organisational management literature state that a status quo change is due allowing organisational practice to adopt formal scientific methodologies permitting handling of complexity in organisations (Curlee and Gordon, 2011; Cicmil et al., 2009).

Another observable element preventing change is behavioural deficiencies in organisational leadership. Leadership deficiencies define as missing high-level skill sets of executive management. Factors in behavioural deficiencies in organisational leadership are a misinterpretation of organisational team inspirations, unawareness of accomplishments, and manager unfamiliarity with individual team member contributions or outstanding performance (The Standish Group International Inc., 2013).

All those behavioural deficiencies in organisational management practice leadership are distinguishable events with a non-zero probability, occur spontaneously, emerge into other states, and have different lifetimes (Widdows, 2003). Such data are difficult for humans to recognise resulting in status quo persistence. Without patterns, there is no forecast of emerging behaviours. Missed pattern recognition by organisational members and resulting persistence of unfavourable behaviour is another observable in favour of Habermasian claims that distorted communication, and coercive power structures dominate in real-world communications in the interest of protagonists and beneficiaries of status quo (Adams, 1996). Non-zero probability is the starting point to establish the analysis of the non-observed by establishing qubits (Bruza et al., 2009)

Review of discussions in academic literature particular confirms the need for an interpretative methodology resulting in bias-free collection and quantitation of subjective

data required to justify controlling and changing intervention initiatives. Thus, the need for RQ1, RQ2, RQ3 and RQ4 is plausible.

Researcher considers deductive mathematical-analytical proof for the claimed human pattern recognition resulting in behaviour preserving the status quo.

2.13 Controlling and changing intervention

Changing behaviour in coercive power structures requires funding and justification.

Controlling and changing intervention are successors of successful interpretative methodologies (Herr and Anderson, 2014; Weber, 2009). Interpretative methodologies deliver the required justification and funding for controlling and changing intervention.

Researcher's positioning results in a methodological approach aimed to transition observations into measurable categories and convert the empirically observed into numeric quantification utilising quantum-like calculations. This research approach is bound to the research topic and embedded in context and articulated in research questions. The context is to apply this new interpretative approach to understand human behaviour, apply the theoretical and ontological underlying principles and to investigate the action required for the next step. The next step after verification of practicality is to transform those ideas into a practical approach meeting the requirements of the researcher particular organisational management practice work environment. This approach requires to meet organisational management practice demands for operational computer systems (Anderson, 1999). This approach is required to base on the theory of separable Hilbert spaces (Yukalov and Sornette, 2009). As the quantum computer is not generally available is this approach exempt from experimental proof. Literature research reviews visionary approaches for further discussion.

The literature review seeks adaptable methodologies preparing for the emancipatory next step. Habermasian ideal speech situation establishes a pure situation. Purity defines as deploying the desired change uncompromised as initial setup. A Habermasian ideal speech situation deploys avoidance of any binding power of obligations where only the unforced force of the better argument prevails (Habermas, 1987a; 1987b; 1990; 2002) as a virtual workspace environment into researcher's work context (Kaku and O'Keefe, 1994).

The literature review informs that there are no practitioner tools, mathematical-analytical procedures, and easy-to-access tools establishing and controlling organisational behaviour. As change requires control is literature review required for research of adoptable approaches. Such controls require to meet organisational management practice acceptance criteria to ensure practicality. The research interest for control is of a technical nature (Habermas, 1972; Herr and Anderson, 2014). The organisational management practice interest is for technical control.

Review of discussions in academic and practitioner literature particular confirms the need for an interpretative methodology resulting in control and change initiatives. Thus, the need for RQ1, RQ2, RQ3 and RQ4 is plausible.

Researcher considers a deductive mathematical-analytical extension of experimental proven interpretative part of this thesis methodology. Experimental proof is not a consideration given the unavailability of a quantum computer at the time of research.

2.14 Lack of domain knowledge in Practice

Change initiatives aimed to modify behaviour in organisations requires certainty for claimed behavioural deficiencies to receive organisational management practice funding.

Uncertainty has a directed graph to lack of knowledge. Any solution approach to the “wicked problem” (Stubbart, 1987, quoted in Pearson and Clair, 1998, p. 62) requires addressing decision making under conditions of uncertainty. In this context is the lack of knowledge considered the lack of domain knowledge (Elster, 1983). Establishing certainty is the logical next step to prepare for control and change initiatives.

The key is to develop scientific rigour for practice-related problems. A review of the last 2-3 decades of scientific progress in the knowledge domain complex adaptive systems reveals that chaos is, in fact, a complexity made up of simple rules (Wolfram, 2002, cited in Miller, 2007).

Common across organisational sciences and practitioner literature is the acknowledgement that co-evolutionary forces and movement of these forces result in the necessity to

understand multiple trajectories vs just one trajectory (Merali and McKelvey, 2006; Kash and Rycroft, 2002).

What's different between science and practice is that practice does not systematically nor methodological transform tacit, the unwritten know-how of participants about behavioural issues in organisational context into knowledge that had, beyond being written, become codified (Kash and Rycroft, 2002).

Codified knowledge substitutes insufficient knowledge (Eisenhardt and Martin, 2000; Pedler, 2010). At the time this process of codifying knowledge is computer operationalised will a constant flow of tacit knowledge establish a practitioner innovation to organisation interface (Dougherty, 1999). This practitioner innovation interface empowers upper echelon leadership to know and to innovate (Uhl-Bien, Marion and McKelvey, 2007). Empowering higher level leadership to know addresses the issue of the metastable behaviour of middle management who keep applying failing practices. A methodology establishing encoded knowledge for the comprehensive real-time understanding of behaviours in organisations skips the middle management and eradicates current power structures (Heckscher, Heckscher and Donnellon, 1994). Current power structures in organisational management practice require middle management champions to transmit explicit knowledge of behavioural issues in organisations to upper echelon organisational ranks (Howell and Boies, 2004). Substituting the authority of middle management with neural networks and technical controls result in explicit knowledge for organisational stakeholder and other organisational success beneficiaries (Barker, 1993; Heckscher, Heckscher and Donnellon, 1994).

Interpretative methodologies providing certainty for claimed findings permit to reach out to upper echelon leadership resulting in fixing the lack of knowledge in the domain of behaviour in organisations and organisational context. Fixing the lack of domain knowledge transforms uncertainty in certainty expediting the ability to innovate (Collins, 1997; Cames, 2014).

Review of discussions in academic and practitioner literature particular confirms the need for an interpretative methodology resulting in control and change initiatives. Thus, the need for RQ1, RQ2, RQ3 and RQ4 is plausible.

Researcher considers next steps for the methodological interpretative research goal.

Experimental proof is not a consideration given the unavailability of a quantum computer at the time of research.

2.15 Lack of domain knowledge in action research

The uncertainty principle, defined in the context of lacking domain knowledge on how to bias-free collect and quantify subjective data in action research field studies, has determined the last decades of scientific non-progress in action research and action science (Elster, 1983; Miles, Huberman and Saldana, 2013).

Literature research revealed that the uncertainty principle has not been introduced into action research nor integrated into action science research instrumentation and methodologies. Disregard for the uncertainty principle is a lack of knowledge.

Science has determined that no empirical processes apply to indeterministic, non-linear situations (Aerts and Aerts, 1997). Indeterminism in behaviour is the assumption that human behaviour can never deterministically defined. Certainty about human behaviour is entirely the outcome of measures of the likelihood that behaviour will occur (Dubois and Toffano, 2016). Empirical evidence defined as data collection through observation or experience is only one source of knowledge. Theories and pure logic is another source of knowledge. The researcher considers both to develop a methodology to introduce certainty in a researcher's work situation.

Habermas considers his "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) as independent from the empirical knowledge. Ideal speech is ideal because it applies independently of the social structure of the participant. Participants are unable to realise an ideal speech situation; they only can participate. Ideal speech is universal in applicability (Adams, 1996).

Influence and power define an indeterministic and constant state of socially indebted and to inhibit full repayment (Gouldner, 1960). Permanent comparative indeterminacy provides the opportunity to apply both strategies, the empirical to satisfy part one of the knowledge equation, the mathematical-logical to handle the certainty. This strategy deploys the "ideal

speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) universally to apply this research strategy across a variety of unspecified performances and control the behaviour of people regulated by the norm of reciprocity and the law of reciprocity (Cohen and Bradford, 2003; Habermas, 2002; 1990; 1987a). The theory of quantum mechanics applies the law of reciprocity for quantification and purity definitions of performance and control (Peres, 2006; Atmanspacher, Römer and Wallach, 2002).

The empirical case of the law of reciprocity is unrelated to any symmetry (Peres, 2006). From early chaos theory on, to chaos theory successor complexity theories and up to today’s reconsideration of quantum mechanical procedures in the social realm assume symmetries a baseline of space (Bruza et al., 2009), time (de Barros, Montemayor and Assis, 2017; Bruza et al., 2009), dynamic continuum of intentions (Yukalov and Sornette, 2011; Busemeyer et al, 2009), and that each measurement transforms the continuum into increased certainty (Born, 1955; Selinger, 2010; Nielsen and Chuang, 2010).

This assumed symmetry accepts that even simplest values cannot be determined with confidence. In the domain of physics, this simplest value is the speed and location of particles that make up existence. Mathematical procedures prove to resolve impressions of chaotic into awareness of complex adaptive processes via algorithms establishing predictive analytics via simple rulings. Thanks to those mathematical procedures regularities establish resolving ambiguity and chaos into geometry, the geometry of nearness. Closeness and nearness are defined topological as a surface. Connectivity to other surfaces establishes by adding other near and local findings into a context. The context is used to find other topological surfaces. The distance between the surfaces is fixed and calculated. Reuse of the known fixed and already calculated distance between the surfaces lead to new surface to surface connectivity. This process generates data not coming from data collection (Tandon et al., 2017).

Those proven mathematical-analytical procedures and their proven precision in predictive analytics result in astonishing certainty determination to other domains in case other domain data introduce. Human behaviour defines in the continuum of the social realm of intentions and preferences for behaviour (Yukalov and Sornette, 2011; Busemeyer, Wang and Lambert-Mogiliansky, 2009). This approach appears adaptable.

The continuum is the context. The context is defined by topological distance and not by sense-making biases of observers or communication participants (Widdows, 2003; Widdows and Peters, 2003). Such law-like pattern and calculation of search routines gain regularities that are non-linear and non-sequential. Symmetries calculate and appear as topological nearness with sense-making by visualising the topologies and the connection between such topologies in the Euclidian three-dimensional space. The simplicity gain is achieved without reductionist-induced loss of information. The outcome is an instant understanding. Visuals provide significant advantages via geometrical thinking (Hair et al., 2010; Tufte, 2001). Organisational management practice demands for real-time, instant control of behaviour in organisational context complies by an instant understanding of geometrical thinking (Marshak and Grant, 2008; Habermas 1990).

Instantaneous understanding guide intentions to act and behave (Festinger, 1962). Instantaneous understanding of humans is always different and error-prone. In the context of the theories applied explains simple algebraic nullification why common-sense human understanding is illusional and leads to misconception for their behaviour. Humans understanding is a macro world perspective. Humans perception of chaos is a chaotic understanding. Chaotic understanding is the result of a lack of knowledge. Lack of knowledge is amiss in information. Missing information is the result of applying symmetries to an asymmetric world. Algebraic nullification mathematically proves the process of missing information by humans' affinity to cancel out events. Based on humans' apparent nullification of non-linear events humans assume a linear cause and effect in a non-linear world. The macro world understanding is an illusionary assumption (Benbya and McKelvey, 2006). By assuming that the macro level embeds in symmetries the non-linear system of humans surroundings appear as a result of assumed symmetries, ergo appears deterministic (Lorenz, 2007). This assumption that symmetries determine the universe lead to justifications of decades of continuing application of symmetric Markov models and the flawing law of total probability in social sciences (Wang and Busemeyer, 2013; Ashtiani and Azgomi, 2016). Paired with affinity to cancel out events that should not occur a messy coincidence (Searle, 2007).

A scientific approach requires to address this issue. A scientific rigour methodology requires the application of mathematical-logical analytical procedures proven to calculate the

existence of the indeterministic and presence of possibilities for probability determination. Given this hidden nature at the macro level, a theory of deterministic systems at the macro level can no longer prevail. The appearance of chaos theory and complexity theories marks the time when the law like symmetries reviewed in the context of complex adaptive systems (Wang and von Tunzelmann, 2000; Anderson, 1999). Organisational sciences acknowledge that research design can generate and test theory using complexity theories to address weak generalizability of findings in social sciences theory by alternating dataset (Shah and Corley, 2006). Unfortunately has action research and action science missed to follow the next evolutionary, logical step to integrate the successor of complexity theories.

Review of discussions in academic and practitioner literature particular confirms the need for a new action science methodology utilising the theory of quantum mechanics and the theory of communicative actions to provide a more complete understanding of human behaviour in action research field studies. Thus, the need for RQ1, RQ2, RQ3 and RQ4 is plausible.

2.16 Closing the gap between scientific progress and lack of domain knowledge in action research

Review of academic literature in management research and the philosophy of language state usefulness by integrating changes at the micro level in both the micro-world and macro-world (Searle, 2007). Those cascading effects that change at the micro level occur in both the micro-world and macro-world resonance across a variety of scientific disciplines and report as experimental reproducible (Wallace et al., 2010). Academic peer-reviewed completed research stating that analytical procedures according to the theory of quantum mechanics explain data more complete than symmetric statistical alternative mathematical procedures are numerous and provide ideas for transformation into action, e.g. adaptable research design for conceptual combination (Aerts, 2009), perception (Atmanspacher, Filk and Römer, 2004), judgments (Khrennikov, 1999), disjunction effect (Busemeyer and Bruza, 2012), conjunction fallacy (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008), and liar paradox (Aerts, Broekaert and Smets, 1999).

Chaos and complexity theories findings confirm the usefulness of quantum-like mathematical procedures over the last five decades. Chaos theory's discovery that minutest changes cause unpredictable effects in macro systems later declared as exposure of non-linear systems is known as the "butterfly effect" (Lorenz, 2007; Baines, 2013). The literature reviewed reveal the scientific progress in the converting of mathematical-analytical procedures from the realm of physics into the realm of social sciences. Action research requires keeping up with scientific progress. Literature researched provide opportunities to jump straight to this new millennium's understanding of predictability, determination of certainty, combining empirical data with the quantum mechanical predictive analytics, and codification of cause-effect relationship as no longer linear. Encoding of real-world events into shared variables of quantum mechanics mathematical procedures proves the same cause in different effects (Searle, 2007).

Action research mainstream, traditional understanding to explain behaviour in its macro world's chaotic appearances as symmetric cause-effect and the law of total probability is not helping the researcher to apply a methodology that his work situation and organisational context requires. Researcher's work situation and organisational context are lacking certainty for claimed behavioural deficiencies in organisational context (Williams, 2002). For organisational sciences, action science and action research, the "wicked problem" (Stubbart, 1987, quoted in Pearson and Clair, 1998, p. 62) keep its macro world's chaotic appearances. Further practising of Markov methodologies assuming one trajectory at a time only and any other empirical statistical procedure based on the flawed law of total probability appears inappropriate. Further application of illusionary classic macro world cause-effect deterministic assumption lead to prediction failures and deepen the gap between theory and practice (Kieser and Leiner, 2009).

Researcher considers the mathematical-analytical procedures converted from the realm of physics into the realm of social sciences for experimental proof for its practicality. In case experimental proof is positive the hypotheses of research questions RQ1, RQ2, RQ3 and RQ4 confirm.

2.17 Translating theoretical complexity into the particular action of a researcher's work context

Prediction failures deepen the gap between theory and practice (Kieser and Leiner, 2009). Management science mainstream, traditional understanding to explain behaviour lead to severe deficiencies for its claimed findings. Mainstream action research literature reviewed reveal the lack of bias-free data collection procedures and lack of quantification methods to provide certainty for claimed behavioural findings (Williams, 2002).

Bias requires ego. Bias detection requires ego detection. Full exposure of ego requires anonymity (Donath, 2002). Virtual Identities establish anonymity and confidentiality. Virtual participation provides contextualised disruption of the societal status quo of an individual (Gioia and Chittipeddi, 1991). Anonymity, confidentiality and contextualised disruption of the status quo is therefore at the disposition of the action researcher's experimental setup.

A new virtual identity can attribute anonymity to experiment participants as well as to the observing researcher. Disruption of the status quo can be attributed to experimental setups as well as to real-world practitioner scenarios. Virtual community represents authenticated but obfuscated participants (Seigneur, 2009). Virtual communities establish rapidly. This concept of rapid establishment extends to the virtual community on a global scale.

Individuals in virtual identity act at a distance. The concept of non-local action at a distance applies. Non-local action at a distance is no longer bound to the location of action and establishes complementary and generality for its claimed findings (Abramsky and Brandenburger, 2011). The quantum mechanical concept of entanglement and action at a distance applies.

An individual with two identities, one for its behaviour in the real world and the other for its behaviour in the virtual world generalises the practicality to a multitude of non-local action at a distance. A multiplicity of globally dispersed, non-local, non-unique and non-single-site contextual information surfaces categories for axial coding (Creswell, 2013).

Computer operationalised axial coding models achieve humanoid representation by appearing as virtual identity (Yee, Bailenson and Ducheneaut, 2009). Virtual identities require authentication before access to the virtual community is granted. The concept of closed communities applies. Authenticated identities in virtual communities are legitimate

identities (Seigneur, 2009). Work environments of virtual community nature permit users to appear as legitimate users by borrowing a temporary discussion identity. This borrowing procedure applies to experiment participants as well as to the observing researcher. Virtual participation allows the researcher's action at a distance to a given practitioner system. Observation of evolving disruption of the status quo buffers in anonymity and confidentiality. Researcher appears as a peer and not as observing researcher. This research instrumentation allows to scientifically rigorously notate organisational change in practitioner place (Sandberg and Wallo, 2013).

Non-local action at a distance permits investigation of non-locality phenomena. Findings related to non-locality phenomena verify independently from a given particular local context. Communicative action at a distance takes place in the global virtualised environment. Turning participation from real identities to virtual identities free from real-world identity process captivity towards participant's view of reality as one out of multiple viewpoints (Koles and Nagy, 2012; Paniaras, 1997). Participants enrich their interaction competency metaphors via increased input sourced from multiple virtual identities they inhabit simultaneously (Jackson and Lalioti, 2000). Virtual identity exposes ego (Zhao, 2005).

Virtual identity generates an emancipatory effect (Yee, Bailenson and Ducheneaut, 2009). Participants increase their communicative competence by constructing a new virtual space from within an existing virtual space they inhabit (Paniaras, 1997). This virtual workspace environment is not organisational context specific but instead universally deployed across different professions and work-contexts in today's virtualised workplaces (Bargh, McKenna and Fitzsimons, 2002). This context independence satisfies Habermasian requirements for execution of his universal pragmatics. Context independence is an object domain by itself and portable into different settings. This context independence is another requirement Habermas stated as a necessity for the development of universal pragmatics (Habermas, 2002). Commonly stated effects like alienation and unstable identities are considered a feature in a Habermasian sense as they indicate an individual's critical distance to traditions (McCarthy cited in Habermas, 1987a).

Review of discussions in academic literature particular confirm RQ2, RQ3, and RQ4 as plausible.

Researcher considers experimental proof for practicality and validity for claimed anonymity and confidentiality.

2.18 Action research strategy with upfront planned instrumentation

Literature research revealed the practicality of a research strategy with upfront planned instrumentation for a methodology the work context of the researcher requires.

A research strategy with the upfront planned instrumentation of Habermasian pragmatics provides the opportunity to transport research questions into a field study environment where participants contextualise with the research question in a state of social interruption with their real social world (Cames, 2012). Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) is an instrumental stimulus technique. Purposely introduced interruptions enact measures and investigation of latent behaviour (Christianson et al., 2009). A Habermasian healthy reset to zero meets requirements for initial setup to zero for measurement. The universality of such an approach permits applying the same apparatus to deploy the same research strategy with upfront instrumentation to other, different inquiries (Miles, Huberman and Saldana, 2013).

Different inquiries permit to relocate the action and to switch or augment the inquiry to other, new or additional locations. Different inquiries permit inquiries to switch or augment the inquiry to other, new or additional organisational relations. Switching or augmenting the inquiry to other localities and other relations generalise findings. Generalised findings that are independent of action locality are complementary and non-local findings. Findings that attribute as non-local and action at a distance and interaction at a distance evidence entanglement (Gribbin 1984 cited in Wheatley, 2011; Bruza et al., 2009; Atmanspacher, Römer and Walach, 2002). Findings that entangle are certain.

Re-initialisation and reset to zero ensures that behavioural observations of participants are mathematically correct and can verify via quantum statistical significance checks (Holevo, 1973) and multiple quantum statistical hypothesis testing (Belavkin, 1975). A research

strategy with extensive instrumentation and upfront deployment of all required technicalities and computerised operations establish a reusable apparatus. Reusable apparatuses permit swift modification for particular activity or purposes. Reusable apparatus permit swift extensibility for a multiplicity of activities and purposes. Analysing the behaviour of the organisational members simultaneously via their virtual and real-life identities is a typical and critical usage scenario (Koles and Nagy, 2012).

Organisational management practice demands for practices permitting computer operationalisation to appear practically. Research instrumentation with prior deployed instrumentation of apparatuses establishing the Habermasian ideal speech situation appears practically.

Review of discussions in academic literature particular confirm RQ2, RQ3, and RQ4 as plausible.

Researcher considers experimental proof for practicality and validity for claimed portability of inquiries and to relocate the action and organisational relations while keeping the instrumentation apparatuses.

2.19 Extensibility of instrumentation research design

Organisational management practice demands for practices permitting interpretative methodologies face follow up inquiries for control and intervening aspects for behaviour in organisational context (Herr and Anderson, 2014). Practices permitting control and intervening aspects for behaviour in organisational context face follow up inquiries for computer operationalisation of control and intervening aspects for behaviour in organisational context.

Extensibility permitting computer operationalisation for interpretative methodologies for control and intervening aspects of behaviour in organisational context require an extension of research methodology instrumentation. Extension of research of instrumentation requires research instrumentation to transform mathematical apparatus of quantum mechanics into experimental measurement apparatus (Haven and Khrennikov, 2013).

Deployment of an action research strategy meeting organisational management practice demands requires methodological extensions. The data gathering system requires longitudinal simultaneity storage. The simultaneity of two or more than two identities every individual participant possesses who may step into the virtual world (Miller, Resnick and Zeckhauser, 2005). Such an apparatus is a system that acknowledges, confirm, and evidence multiplicity of simultaneous existence within the same individual by establishing appropriate reversible mathematical models as computing algorithms (Nielsen and Chuang, 2010). Such a repository requires the collection of vast amounts of data of new quality enabling action researcher and IT practitioner to measure behavioural interference and forecast simultaneously (Yukalov and Sornette, 2011; Busemeyer and Bruza, 2012).

Review of academic literature revealed adoptable blueprints for soon available near-quantum computer permitting execution of post-interpretative steps in improved research instrumentation and apparatuses. Review of the required prerequisite of such technical controls capability includes measuring of observed behaviour interference and forecasting the same simultaneously on simulation circuits (Golbeck, 2009).

Further review of published near-quantum technical controls establishing management opportunities for post-interpretative, behavioural control and behavioural change initiatives. Reversible evolutionary circuits introduce the concept of replay (Wecker and Svore, 2014). All recorded behaviours of one or many virtual identities a participant poses re-appear as the entangled composite prospect of an individuals' several intention representations. Such an entanglement of intention for behaviour representations realises simultaneously inform of multiple parallel virtual identities one individual possesses. Such parallel intention representation leads to decodable, reversible state representation of the observed entangled interference phenomena (Yukalov and Sornette, 2011).

Review of discussions in academic and practitioner literature particular confirms the need for an interpretative methodology resulting in control and change initiatives. Thus, the need for RQ1, RQ2, RQ3 and RQ4 is plausible.

Researcher considers next steps for the methodological interpretative research goal.

Experimental proof is not a consideration given the unavailability of a quantum computer at the time of research.

2.20 Behavioural interpretative methodologies beyond critical organisational context

Organisational management demands practices for interpretative methodologies beyond critical organisational context face follow up inquiries for automation of first manual procedures (Tsang, 2008). Automation demands require meeting scaling of interpretative methodologies from critical and typical to the enterprise level.

Organisational management demands practices for interpretative methodologies beyond critical organisational context require the research instrumentation to extend in scale. Such a capability to measure observations of behavioural interference and forecast the same is not obtainable in academic literature.

Data storage repository requirements for that do not exist in today's information technologies. Once such quantum decision theory baselined data storage repositories, defined as real-time storage and retrieval mechanisms of entirely observable effects that trigger decoding as soon as another matching effect is present, will supersede Markov modelling in prediction efficiency (Yukalov, Sornette, 2011).

While the engineering task will take likely one or more decades until available in practitioner IT environments, the researcher task is an immediate opportunity for action science to advance on. Construction of optimised virtual communication models sourced from the data gathered from the real-world identity, from the first virtual identity, from the second virtual identity and so on can mathematical-analytical simulated and experimentally tested on a smaller scale (Vaas, 2001a; 2001b). Completeness of projective measurements proven to emerge from quantum circuit algorithms with certainty port scientifically rigorous observation methodologies for behaviour in organisational context to meet organisational management practice demands for behaviour across an enterprise, once the engineering task is complete (Svozil, 2006).

Review of discussions in academic literature particular confirm RQ2, RQ3, and RQ4 as plausible.

Researcher considers experimental proof for practicality and validity for claimed data gathering construction of virtual communication models sourced from the data gathered from the real-world identity and the first virtual identity.

Researcher considers mathematical-analytical preview for organisational management practice demands for scaling interpretative methodologies instrumentation from critical and typical to the enterprise levels. Such mathematical-analytical previews are considered practical although the lack of an empirical case as the unseen and unmeasurable is considered practical in action research (Morvan and O'Connor, 2017; Cooper, 2007).

2.21 Summary

The theory of quantum mechanics and the theory of communicative actions provide a more complete understanding of behaviour in an organisational context than other theories (Aerts and de Bianchi, 2015; Nielsen and Chuang, 2010). Models utilising the mathematical formalism of quantum mechanics provide a patterned formalism for more complete explanations of human behaviour than alternate models not utilising the mathematical formalism of quantum mechanics (Bruza et al., 2009). Models utilising the formalism of theory of communicative action provide a patterned formalism for more complete explanations of human decision making by describing state ontological and defining “ideal speech” (Habermas, 1987a; Habermas, 1990; Habermas, 2002) conditions for research design instrumentation in action research field studies (Blackburn et al., 2003; Franco, 2007).

The application of both formalities applies the non-linear approach of complex dynamics to quantum mechanical state description. It connects the paradigm change towards the non-linear with the paradigm change towards modelling quantum-like. It relates the problem that most organisational endeavours are not prosperous stating behavioural patterns to the issue that action research has not replaced action science instrumentation of theories of less or no help to solve problems in real-world situations (The Standish Group International Inc., 2013; The Standish Group International Inc., 2015; Hastie and Wojewoda 2015; Cames, 2014; Dominguez, 2009).

Review of discussions in academic and practitioner literature confirms the need for an interpretative methodology resulting in control and change initiatives. Thus, the need for RQ1, RQ2, RQ3 and RQ4 is plausible. Researcher considers experimental proof for practicality for a variety of literature researched findings.

Chapter 3: Methodology

3.1 Introduction

This chapter defines a planned, constructed research instrumentation (Miles, Huberman and Saldana, 2013). The research instrumentation strategy outlines. Definitions of the targets of the investigation, specifications for the action on targets, and performance indicators for evaluation of the experiment in chapter results identify in instrumentation and implementation details.

The purpose of this chapter methodology is to mandatorily prescribe the schemes, the tactic, and the performance indicators for the action cycles experiment and results (Greenwood and Levin, 2006). This chapter is a “meta-cycle of inquiry” (Coghlan and Brannick, 2012) into the research process stating researcher assumptions, his opinion of consequences if schemes indicate pass or fail of research question hypotheses and the effects on actions in other action research cycle (Coghlan and Brannick, 2012).

The methods outlined in this action-research “meta-cycle of inquiry” (Coghlan and Brannick, 2012) methodology transform theories and ideas into a methodology for bias-free collection and quantification of subjective data in the researcher’s particular organisational and work context. The methodological approach is by this thesis conceptual and theoretical framework to answer the research questions. The methods developed are the subject of experimental verification in typical and critical real-life situations (Habermas; 1990).

Such an approach depends on experimental verification that this thesis new methodology practically utilised the conceptual framework of quantum mechanics in an action research field study. Such proof has to seek evidence that the researcher’s field research instrumentation eliminated biasing interaction with the observed entity.

Researcher combines the conceptual framework of the theory of quantum mechanics with the conceptual framework of the theory of communicative action. The resulting formalism establishes repeatable procedures for action research field studies. This “meta-cycle of inquiry” (Coghlan and Brannick, 2012) methodology incorporates debates in academic literature in a new action science research strategy with upfront planned instrumentation. Positivist principles from traditional action research (Lewin, 1945; 1948) and action science

instrumentation strategies (Herr and Anderson, 2014; Greenwood and Levin, 2006; Argyris, 1980; Argyris, 1985) combine into a new methodology creating evidence for claimed unbiased findings.

The outcome is a process to understand the behaviour and cognitive interaction of organisational participants more complete. This process is not technical, and neither a machine nor an apparatus. The process is primarily mathematical and requires that participants act in a Habermasian ideal speech situation under a new identity, a virtual identity. The data analysis does not require a specific machine, technology or an apparatus either.

The practice can, therefore, use this thesis' procedures to identify or de-select organisational managers who show a tendency to act hostile and with intent to act contrary to fostering creativity in other team members in the future. Furthermore, the practice can use those procedures, e.g. an interview tool or standardised evaluation tool, for the performance-oriented observation of an organisational department and beyond for multiple organisational department and the organisation as a whole.

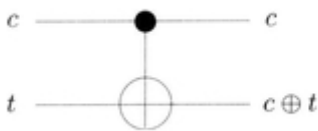
3.1.1 The basic assumptions

Academic theories and praxis relevance

This thesis methodology synthesises academic knowledge production with praxis relevance (Gibbons, Limoges and Scott, 2011). The lack of work significance of mainstream action research and mainstream action science for the organisational management practice, let to latencies for knowledge transfer between academic knowledge production, a.k.a. Mode 1 knowledge production, and practice knowledge production, a.k.a. Mode 2 knowledge production (Huff, 2000). This thesis innovative data collection procedures and data quantification standards assure that data collection occurs in practice and not in a laboratory or a clinical environment. Mode 2 knowledge production, known to accumulate over long periods of time, unmanaged and under no governance control is placed under managed procedures and governed standards for quality reassurance (Huff, 2000). This thesis establishes novel subjective data quantification standards for action research mode 1

knowledge production and manages subjective data collection procedures in mode 2 knowledge production.

CAMES Notation (Non-Linear Orthography Logograms (CNLOL))		
1	TI	Targeted Identity
2	VI	Virtual Identity
3	T_{ix}	Observed components
4	T_{iy}	Observed components
5	V_{ix}	Superposition components
6	T_{ix2}	Additional environmental input
7	V_{ix2}	“AND” of TI observables
8	TI_{2x0}	Targeted Identity copied, observed component
9	TI_{2x2}	Targeted Identity additional copied, observed component
10	TI_R	Repository of environmental observed
11	VI_{2x0}	Copy of TI_{2x0}
12	VI_{2x1}	Copy of TI_{2x1}
13	VI_2	$TI_{2x0}, TI_{2x1}, TI_{2x2}$ repository Copy of TI
14	$AI_{1\leftarrow VI_2}$	Augmented Identity
15	IN	Instances of Quantum Algorithms
16	QN	Nullifiable results of quantum operations
17	CN	CNOT gate. The data representation of VI cognitive dissonance.

		 <p>Logogram visualisation of cognitive dissonance in mathematical formalism of the theory of quantum mechanics.</p>
18	IN^{-1}	Reversible gate
19	$QBIRAn$	Quantum reversible algorithm
20	QBIDTP	Quantum data transformation injection point
21	adn_{TI}	Attitudes, desires, needs (behavioural action preferences)
22	TI_{space}	Shared variable. Hosts all observed mental vectors and mental states
23	TI_V	Mental vector
24	VI_V	Mental vector
25	TI_{ST}	Mental state
26	qbi_{xy}	qubit (pure state)
27	QRA_1	Coding of companion TI, or VI or TIX/TIY influence on TI
28	QRA_2	Additional Virtual Identity influence freeze/defreeze procedures - preservation of time reversibility – anytime ad hoc previous TI state calculations from current VI state prediction analytics
29	QRA_3	Acquire the original experimental environment observables from practitioner usage scenario participant (TI, Tlx, TIy) again at any given time from VI2 predictive analytics operations
30	AI	Augmented Intelligence / Artificial Intelligence
31	FM_n	Formation of “vicious circles of mediocrity” Masuch, 1985, p. 28)
32	IAn	Initial amplitudes

		Preferences for actions.
33	TIEO	Time-indexed evolution operator
34	FPT	Focused predictive task
35	DM	Dynamic momentum. Cognitive dissonance.
36	GIF	General Interference Detection
37	DS	Dominating mindset
38	CV	2-argument research question
39	CV	Context variable
39	KPI	Meaningful measure. Key performance indicator. Magnitude baseline.
39	Prb	Predicted behaviour

Figure 1 Notation

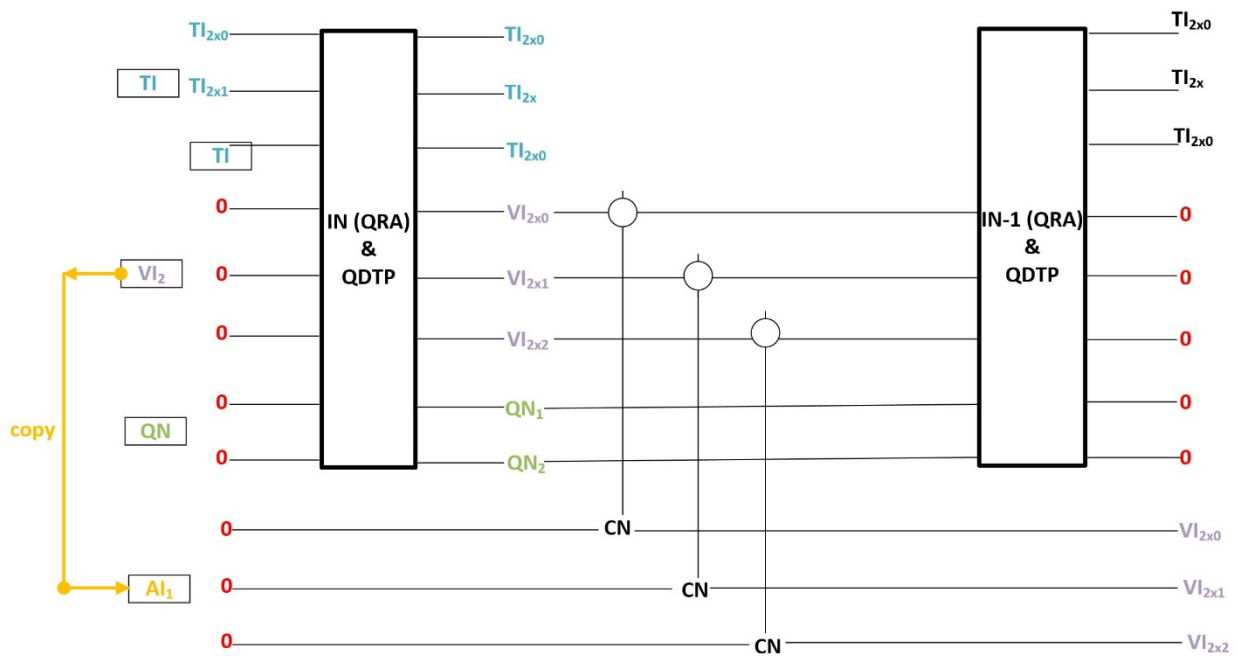


Figure 2 Habermas ideal speech situation avoidance of researcher contamination with his research subject and research environment

3.1.2 Preservation of uncontaminated research environment

This thesis methodology preserves an uncontaminated research environment. The researcher does not influence the data itself during scientific rigour application of subjective data collection and quantification. The procedure is designed to permit interaction and evolution between the target of evaluation and its environment as ongoing.

Ongoing observation of organisations and organisational member communicative actions focus on state changes. Evolution operators compare previous and actual user communicative actions. Measurement occurs on models of mirrored superposition of data collected rather than on superposition and data collected itself. Mathematical procedures target logical operations on the mirrored superposition of superposition (Marsh and Briggs, 2009). Operating on mirror avoids the direct interaction of a measuring apparatus with the observed (figure 2).

The Habermasian ideal speech situation requires a researcher issued virtual identity. Virtual identity ensures the transition from targeted identity (TI) to the virtual identity (VI) (figure 1, figure 2). The targeted identity is the identity of the organisational participant in his real working environment. The virtual identity is the identity of the organisational participant in the Habermasian “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990). The values are resulting from measures from organisational participant virtual identities complete in temporary variables, e.g. QN and AI (figure 1, figure 2). Any subjective data contributing to the research questions move to an AI buffer variable (figure 2). An AI buffer is a variable that temporarily holds observations from the same virtual identity. In case a targeted identity (TI) has more than one virtual identity (VI) then will more than one AI buffer ensure separation of measures. Any subjective data that do not contribute to the research questions buffer in QN variable, a temporary location accumulating observations that can discard (figure 2).

TI and VI states (figure 1, figure 2) accumulate into imaginary states, labelled AI states (Aharonov and Vaidman, 2008). Measures execute on AI states. Measures result in amplification procedures reducing complexity in AI states to the hypothesis the researcher designed for yes/no prove. Amplification procedures create a minimum and maximum

measure and highlight only the peak values. Focusing on amplitudes concentrate time and efforts on the essential findings vs getting lost in insignificant detail (Brassard et al., 2002).

An AI state is a variable holding measure of one or more than one AI buffer variables. An AI state accumulates temporarily hold observations from the same virtual identity. If a targeted identity (TI) has more than one virtual identity (VI) resulting in more than one AI buffer, then will one AI state variable host the accumulated measures of many AI buffers. This variable AI state is the data source variable for next step processes the research instrumentation considers helpful in answering the research questions (Zhang and Peace, 2014).

AI states are numerous ensuring processing of complex time-based evolution and longitudinal observations. AI states build and discard on an as-needed basis. Some AI states are not measured and continue to function as registers keeping TI and VI states. The AI states utilised for a specific hypothesis test dispose of after measurement.

In the case of hypothesis tests on VI/TI states the research instrumentation and the measuring procedures interact directly with the observed VI/TI. Interaction creates interference effects. Applying the interference pattern on biased VI/TI states result in measuring interaction interferences versus measures contributing to the research question. Results from biasing research instrumentation invalidate claimed findings.

The research interest to measure VI/TI individual behaviour, their preferences for behaviour and to predict VI/TI behaviour with certainty requires that a VI/TI to expose fully quantum behaviour (Aerts, Broekaert and Smets, 1999). A VI/TI expose fully quantum behaviour in the presence of interference. Measured interference indicates a natural emerging and measurable condition. Observable dissonance in human decision making exposes data informing about inner dynamics between action and preferences for action (Festinger, 1962; Morvan and O'Connor, 2017). In case the presence of interference in VI/TI is evidenced, another measuring process initiates. This additional process measures VI/TI conflict to decide on how to behave.

This thesis research methodology measures on AI states and not on VI/TI states (figure 2) ensuring that VI/TI is kept in a natural condition of conflicting behavioural decision making. This natural condition is the superposition condition. The VI/TI conflict is to decide on

behaviour narrowed down by the researcher to two options. These two options are the research question hypothesis or 0-hypothesis. In case the VI/TI is still in a natural superposition condition the conflict exposes as measurable interference. The Interference pattern applies. Resulting measures validate as reproducible. Reproducible validation for claimed findings creates certainty.

In the case when a research question performs directly on the observed TI and VI, the research instrumentation and measuring procedure entangle with the observed TI/VI states. Measuring interferences on entangled states measure the interaction. Measuring interferences in entangled states would evidence that biasing interaction between research instrumentation/measuring procedure on the observed TI/VI occurs. Biasing interaction influences, changes and eventually ends the naturally occurring interference of VI/TI states. The end of the naturally occurring interference of VI/TI states would render VI/TI states inoperable for further interference pattern processing. The end of naturally occurring interferences ends the naturally occurring superposition. The end of naturally occurring superposition ends researcher's opportunity to inject a two-valued hypotheses test into a different behaviour decision making (Aerts and de Bianchi, 2015). Measures of biased TI/VI states would no longer report the unbiased evolutionary development of VI/TI states. Inability to observe the unbiased evolutionary development of VI/TI states would render further research of TI/VI states inoperable for further bias pattern processing. Disruption of scientific rigour data gathering, biasing interactions by the researcher, the interaction of research instrumentation with the observed participant, render the subjective data observed inoperable for further interference pattern processing (Bruza et al., 2009; Wecker and Svore, 2014; Nelson and McEvoy, 2007).

The research interest is to understand the individual state of mind by comparing time-based state differences (Aharonov and Vaidman, 2008). This thesis methodology keeps the observed VI/TI in a naturally occurring superposition conflict measuring research question hypothesis repeatedly. Porting the same research question into many conflicts results in understandings of VI/TI inner dynamics for behaviour. This thesis research instrumentation utilises quantum mechanical mathematical-analytical procedures to associate time-based state differences into evolutionary dynamics to forecast VI/TI behaviour with certainty.

This thesis methodological application of scientific rigour in data gathering procedures and during data analysis results in continuing researcher analysing opportunities, during and after data collection, without compromising further application of the agreed modelling methodology for analysis and verifiability of claimed conclusions. This thesis methodology aimed to not interfere with the research subjects unless explicitly stated, permits continuing observation of the researcher's particular organisational and work context.

3.1.3 Organisational interaction data encoding/decoding

Work context interaction, organisational, and real-world organisational communication and typical, critical usage scenarios are subject of researcher's notation encoding and decoding the observables. A defined listing of characters, numbers, symbols, punctuation, and letters sequence into a specific format ensures efficient co-negotiation between academics and practitioner (figure 1). Establishing a common language between academic driven further theoretical development and practice usability verification is vital to translate the complexity and subtlety of ideas into evidence-based management in the researcher's particular work context (Rousseau, 2006).

Encoding ensures organisational member interaction data persists. Decoding ensures organisational member interaction data retrieval between co-negotiation transmissions between an academic researcher and organisational practitioner. Those agreed notations obfuscate the complexity of the mathematical-logical procedures and eliminate the necessity for the organisational management to communicate in mathematical terminology (figure 1).

The researcher carries the responsibility for scientific rigour methodology and practice relevance by adapting data gathering to the problem at hand. This thesis' methodology provides labelling, classification and categorisation of the actual data collected and formulation of research question as yes/no hypothesis. Researcher requires operational procedures co-negotiating between theoretical development and problem-oriented societal implementation. This operational procedure ties to the deployment of a Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990). This dual approach transports mathematical and methodological rigour into the organisational context.

Scientific knowledge transforms into sound societal knowledge by a build-up of “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990), deployed as survey monkey questionnaires, by virtual identities for researcher and participants and virtualised communicative actions in chat rooms and already existing virtualised organisation communication scenarios.

Further details how this methodology visualises geometrical thinking, transform into real-time organisation management intelligence and how practitioner usage scenarios subject to the researcher’s encoding and decoding of observables are available in Appendix A, B, and C.

3.1.4 Modelling

Direct influences from scientists on the observed or researcher contamination of environmental factors in research setup result in biased measurements and render the observed inoperable for further interference pattern processing, thus for bias-free quantification of subjective data and prediction of an individual’s future behaviour. Literature research revealed this methodological deficiency and discussed countermeasures.

This thesis methodology adapts entanglement modelling. Entanglement modelling create simulators (Aerts and Czachor, 2004). Those simulators require measurement of the local context in independent locality variables. Any other dimensions, other than local context, amount as generalizable structure. Generalized structural variables measure interactions sandwiched between separate local assemblies. Modelling of generalizable non-local findings accumulate to ever-increasing amounts of state representations. At some point in time, this process will allow the researcher to consider all possible non-local and local states without the need to define causal relationships (Pylkkänen, 2006).

Such a non-causal modelling approach can expose in what way behaviour emerges without the need for instant relationship definitions. A replay of the modelled interaction of real actors by virtual actors results in the opportunity for the researcher to simulate the emergence inner dynamic of behaviour (Van Dam, Nikolic and Lukszo, 2012). The dominating mindset (DS) (figure 1) for agreed on behaviour in the specific work context observed emerges by simulation ongoing behaviour of a multiplicity of actors (Dijkema, Lukszo, and

Weijnen cited in Van Dam, Nikolic and Lukszo, 2012). Then, the results of any group behavioural forecast visualise as a graph. The behavioural dynamic representing behavioural preferences and intentions to behave in the future visualise as angular momentum. Modelling on simulations executes on individual organisation members' subjective data or groups made up of such individuals. The evolving inner dynamics of individual or group emerge as behavioural forecast. Analytical results are accessible in AI variables. AI variables hold measures resulting from two procedures (figure 2). One procedure accumulates observations from one or more than one AI buffer resulting in mirrored reality. The other procedure interacts with the mirrored reality by augmenting AI variables. Augmentation is the result of modelling. Researcher applies the observed inner dynamic of behavioural decision making observed. This dynamic continues the unitary evolution of simulation. In case the unitary evolution continuous in simulation predictive analytics bases no longer on values obtained from observation. Predictive analytics no longer bind to direct measures in local context create non-local states.

Research question continues to evolve based on researcher augmenting observed data with virtual data. Virtual data are the result of inner products according to the mathematical framework of the theory of quantum mechanics and the theory of separable Hilbert spaces (Van Rijsbergen, 2004).

As there can be more than one AI variable that continues its evolutionary emergence are there more than one trajectories for possible behaviours emerging (Busemeyer and Bruza, 2012). The number of trajectories a researcher considers useful in answering his research questions is infinite (Toffoli, 1980). The point in time the researcher considers the accumulation of possible non-local and local states of behaviour as sufficient is the point in time when behavioural characteristics emerge.

Conventional agent-based system simulations of human socio-systems require many observations of parameters, conditions, actors, and environmental worlds (Dam, Nikolic and Lukszo, 2013). The time it takes until a threshold is determined, until the data is a sufficient amount, and the quality of data collected acceptable is excessive. This thesis methodology substitutes conventional agent-based simulation with more efficient query complexity and more efficient time-complexity procedures (Stephen, 2011). As a result, the amount of data

and time required to understand and predict organisational behaviour is reduced, significantly. The time required to generate all possible states by calculating superposition of states is significantly less than waiting for the myriad of factors to appear and be observed in the real world (Vaas, 2001a).

This accumulation process can be expedited and become the subject of engineering efforts to apply mathematical procedures that proceed in no time until that arbitrary point in time is reached resulting in the calculated emergence of predicted behaviour (Vaas, 2001a). Harnessing the myriad of the communicative interaction of actors until dominating mindset (DS) (figure 1) for agreed on behaviour in the specific work context observed emerges is reduced to engineering efforts. Engineering efforts can utilise this methodology variable, and logical steps to operationalise storage of finite states in viable dimensions. Appendix B and Appendix C outline operationalisation aspects of this thesis methodology.

The time boundary, an unpredictable factor for real-world action researchers that slows down knowledge gain until researchers observe emerging behaviours, is operationalised in this thesis methodology as a mathematical probability calculation. The time factor required for action researchers to build local or non-local axioms of comparable real-world observations reduces to the time required the researcher need to develop and apply mathematical formalisms for threshold definitions (Stephen, 2011; Green et al., 2013; Ryoo and Aggarwal, 2006). Once this threshold is defined, all possibilities of behaviour accumulated, until the purity boundary of maximal knowledge have been reached and operationalise as analytical simulation (Aerts and Czachor, 2004; Bisconti et al., 2014). Such simulations visualise preferences and intentions to act as evolving dynamics of an individual organisation participant or groups made up of such individuals (Van Dam, Nikolic and Lukso, 2012). Such visualisations represent augmented reality, a mathematical forecast of all possible dynamic behaviour in an organisational context.

Forecast of behaviour in organisations is not dependent on the excessive accumulation of observable, available knowledge from real-world data collection and free of researcher biases on the observed entity. Intervening on quantum augmented reality avoids the researcher contaminating the observed. Augmented reality is a simulated reality. Simulated

reality is a set of vectors in Hilbert space providing three-dimensional images of past, present and future mental states as vector combinations (Aerts and Czachor, 2004).

This thesis methodology produces probabilistic predictive analytics of organisational member behaviour (Glimcher, 2005). Probabilistic predictive analytics execute on Hilbert spaces. Hilbert spaces host researcher hypothesis and testing requirements. The complexity and context of the researcher's hypothesis determine the number of dimensions required in Hilbert spaces. Projection of vector values leads to vector state modifications simulating all possible future states in finite limits set.

This future state of affairs is a forecast that expresses in geometrically thinking as three-dimensional images with angular momentums and mathematically as one linear function. The merging vectorisation creates observables for researchers to use in simulations. The visualisation of researchers' intervention consists of researchers' visual modelling of the problem as process and visuals of the emerging behavioural patterns (Dam, Nikolic and Lukszo, 2013).

Researcher's notation (figure 1) prescribes formalised models for symbolic encoding/decoding of observed communicative action into Habermasian concepts of communicative action. Sense-making is subject of the theory of communicative action. Mediocre, suboptimal processes, systematic or pathological distorted communication are encoded ensuring maximum information gathering (Liddicoat, 2011).

3.1.5 Introducing virtual identity as the Habermasian mathematical basis

An organisational participant's behaviour enters as virtual identity parameter mathematical equations researcher produced according to the mathematical-analytical framework of the theory of quantum mechanics and formalism utilised in quantum-like (Khrennikov, 2010), quantum structure (Aerts, 2009), and weak force measures (Atmanspacher, Römer and Wallach, 2002).

An organisational participant's questionnaire responses transition into superposition and interference phenomena and a measurable framework for hypothesised research question for a yes, no and superposition of both.

This quantifiable consciousness of multiple alternate perspectives for the same situation leads to state categories of the observed actual and consciousness itself and is located at superposition opposite to the actual macro-world observed state of consciousness (Conte et al., 2009). The macro-world in the context of this thesis is the researcher controlled Habermasian “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990). The underlying observable mental operations and the resulting consciousness geometrically visualises as simultaneous states in Hilbert space. Hilbert space mathematically formalises as a multidimensional consciousness that is reversibly verifiable (Toffoli, 1980).

Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) defines the boundaries and dimensions in Hilbert space. Experiment participants and data gathered from those participating during the experiment collect as an autonomous and closed system. TI and VI are separate reference points in Hilbert space. Data are belonging to TI and data belonging to VI separate from each other (Llinás, 2001) (figure 2).

Analysis of group behaviour results in a determination of the dominating mindset (DS) (figure 1). DM visualises as a graph and depicts every individual participant’s predicted behaviour. Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) defines the restrictions for DM determination. Only observations occurring inside the boundaries of the ideal speech situation consider. The boundaries of the Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) define the macro-world. The macro-world is where participants expose their inner-world to the outer world through language, utterances and action (Habermas, 2002). Language, utterances and action are the data collected. The macro-world is where the theory of communicative action pattern applies to sense-making (Aerts and Gabora, 2005). Sense-making is the starting point to articulate the research questions (Ross and Chiasson, 2011).

This methodology mirrors the observations from the macro-world into Hilbert space. Research question findings, e.g. the final DM determination, quantify according to the mathematical-analytical framework and strict limitation to consider only data collected from Habermas “ideal speech situation”. In case the participant’s behaviour exposed to the macro-world inform of language, utterances and action to other VI participating in the boundaries of the Habermas “Ideal speech situation” (Habermas, 2002; Habermas, 1987a;

Habermas, 1990) additional interference pattern apply to analyse VI influences to VI (Llinás, 2001; Searle, 2005) and incorporate this into DM determination. In case such conversations do not occur is the depiction of every participant as a closed, autonomous system correctly stating facts.

3.2 Translating ideas into action in researcher's particular work context

3.2.1 Mindset determination of organisational team, staff, or an entire organisation

Vectors, dual vectors, inner products, and outer products make up the encoding of subjective data collected from individuals and groups made up of such individuals in a typical and critical work context (Habermas, 1990). Subjective data collected enter the conceptual framework of quantum mechanics as shared variables to create vectors and operators. Vectors and operators represent human capacity for grouping at the level of basic perception, conceptualisation and decision making for their behaviour.

3.2.1.1 *Transformation of theoretical complexity into practicality*

Mental conceptions are the basis for mental contact with another. Mapping out reference points identifying targeted identity (TI) mental conceptions establish access points for evaluation of behavioural responses of organisational members and experiment participants (Langacker and Langacker, 2008). Mental conceptions access points inject into Hilbert space as dual vectors. Dual vectors permit to consider the hypothesis and null-hypothesis simultaneously and at different times.

A multiplicity of such individual reference points permits polynomial access to a multiplicity of others, defined as different targeted identities (TI) mental conceptions. Mathematical procedures kept polynomial restrict to constants, variables and exponents. Polynomial keeps the mathematical procedures simple and permits visualisation of findings as a graph. Polynomial results in rapid calculations and visualisation options (Schützhold, 2003). Swift calculations and visualisation are what the action researcher's current working situation requires. Responding to the practitioner rapidly and via a visual aid result in instantaneous and simplifying understanding. The complexity and subtlety of the academic theories vanish.

This multiplicity of individual reference points will map out the general state of other potential targeted identities and constitutes the general state of the dominating mindset (DS) (figure 1) of the targeted identities state of mind, e.g. mindset of an organisational team, of staff, an entire organisation or internet based online communities of any size.

3.2.1.2 Utilization beyond organisational context

Vectors are the essential elements that reference points. Targeted identities (TI) are real identities of real humans. The amount of collectable information of TI labelled dominating mindset (DS), limits by the encapsulating entity bounded grade of locality, e.g. in the virtual organisation teams only bounded by the user capacity of the communication/collaboration tool applied. In case of this thesis experiment, it is the capacity of the chat room tool utilised. In case of work context beyond chat room tools, it is the capacity of already existing virtualised organisational communication suites, e.g. Microsoft office 365.

In the case of the former and of small organisations, the number of organisational members is in the dozens, in the case of larger organisations and enterprise organisational communication tools it is in the hundreds or thousands. Identification of TI mental conceptions access points, defined as a dual vector, focus on the targeted identity itself as the reference point. By keeping the mathematical procedures polynomial, the procedures keep simplicity resulting in swift responses to the practitioner (Schützhold, 2003).

Polynomial simple procedures permit consideration of the substantial more organisational members. Exponential complex procedures exclude from this thesis methodology.

Polynomial analytical procedures guarantee swift responses to organisational stakeholders and organisational success beneficiaries.

The response time of this thesis procedures is the same for small or large organisation teams. The mathematical procedures scale independently from the amount of organisational members the researcher or practitioner takes into consideration. If one organisation team is the target of evaluation or many organisation teams or even an entire organisation does not affect the response time to the practitioner. Such usage scenario beyond organisational context is possible by the outlined vectorisation of data collected from subjects. Subjective data are accessible as vector reference points. From here a map out of a TI's mental connections follows. Anything mentally accessible from this vector

reference point is the target of further investigations. Incorporating new mental vectors as polynomial variables is necessarily the only complexity that occurs and the key to using this thesis methodology beyond the typical and critical organisational context scenario (Langacker and Langacker, 2008).

Any measurement of mental paths strictly follows the same very basic rules across small or large practitioner usage scenario. The basic rules demand that measuring operations execute after sufficient superposition and entanglement have occurred. Leaving time for entanglement means that measuring of the organisational member communicative interaction occurs after an influence on the VI occurs. In the case of the experiment, this is the researcher's issued questionnaire. In the case of use cases beyond the experiment and organisational context use case, this is a communicative action one individual executes with others. Leaving sufficient time and opportunities for the observed VI to entangle with the superpositioned is vital for predicting behaviour with certainty (Wendt, 2015). Both measures, the measure that the preliminary condition of sufficient superposition and the measure of the entanglement with the research context, evidently occur are subject of this experimental thesis verification.

3.3 A methodological approach to steer behaviour in organisations in the desired direction

This "meta-cycle of inquiry" (Coghlan and Brannick, 2012) uses the theory of communicative action as a building block for a planned methodological approach to establishing failure variables attributable to human behaviour in organisational contexts. Those regulations demand that Habermasian categories of truth (Habermas, 1987a), sincerity (Habermas, 1987b; Chomsky, 1957), and normative rightness (Habermas, 1987a; 1987b) introduce into measurable verification procedures. Procedures enforcing such regulations are executed as language game and build the agenda for communicative action and discourse in organisations. Procedures enforcing regulations for communicative action is why a Habermasian construct, the "ideal speech situation" is utilised.

Anything this methodology outline occurs from start to finish in the boundaries of an "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990). The questionnaire, the

mathematical construct (figure 2) to bias-free collect subjective data, the principles of quantification of subjective data and the researcher's analytical procedures require a research strategy with upfront planned instrumentation. This upfront planned instrumentation is the Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990). The theory of communicative action provides higher dimensional sense-making augmenting the lower dimensional focus of the theory of quantum mechanics.

The theory of communicative action is used to make sense of the subjective data and the behavioural findings that mathematically valid and verifiable state with certainty an individual's behavioural strategy. Findings from empirical work, the subject of mathematical procedures applied, relate to Habermasian explanations for attitude, desires and needs (adn_{π} ; figure 1) an individual to expose in his behaviour according to Habermas critical theory (Habermas, 1987a; 1987b). This research study and the resulting methodology consist partly of experimental procedures but in the boundaries of the research question and the philosophical orientation of the research study. This philosophical orientation is the lower dimensional theory of quantum mechanics and the higher dimensional theory of communicative action.

3.3.1 A planned approach to timely intervene observed pathological and distorted behaviour in organisational context

An action research design strategy, capable of measuring an individual's mindset and an organisational member's abilities to accept truth as an emotional state of feelings measures if this individual constraints himself to base their behaviour on interpretations that do not contradict statements "accepted as true" (Habermas, 1987a).

An action science research strategy capable of detecting an individuals' incapability or organisational member's unwillingness to accept such obligations to truth and sincerity indicates an individuals' incapability to judge the acceptability of speech acts (Searle and Vanderveken, 1985).

Such evidenced incapability to obligate themselves to truth and unwillingness to accept free speech of other organisational participants or organisational members justifies a planned approach to timely intervene observed pathological and distorted behaviour in

organisations. Such indications require the organisation to move to timely countermeasures to prevent the development of or to stop “psychotic organisational cultures” (Masuch, 1985) that would otherwise, in case of further progression, eventually culminate in less competitive capabilities for the organisation (Cames, 2013). Such findings will be of extraordinary interest for organisational stakeholders, other organisational success beneficiaries and beyond for investors and for publically traded companies as well.

This methodology is the practical, executable answer to research questions RQ1 and RQ2. The thesis experiment subjects categories of “creativity” and “diversity” as context to measure incapability and unwillingness of an organisational member to accept obligations to “truth” (Habermas, 1987a; Habermas, 1990, Habermas 2002) and “sincerity” (Habermas, 1987a; Habermas, 1990, Habermas 2002). This thesis methodology verifies such based on interpretations that do not contradict statements accepted as true (Habermas, 1987a) via quantum mechanical “truth” or “falsehood” determination (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012). Competitive advantage by strengthening communicative action competency is a Habermasian category. This Habermasian category enters the mathematical procedures adapted from the theory of quantum mechanics. Interfacing Habermasian ontology with quantum-analytical procedures proofs the hypothesis of RQ1, RQ2, RQ3 and RQ4 plausible.

On the other hand, an application of Habermasian ideal speech regulations in discourse executed as a researcher proctored ideal speech scenario, retrain individuals’ reason and rationalisation skills towards a mutual understanding vs primarily following selfish interests (Fultner in Habermas, 2002). Retrain an individuals’ reason and rationalisation skills towards a mutual understanding elevate the theory of quantum mechanics and the theory of communicative action as a building block for a planned methodological approach to intervene and steer problematic social structures in the desired direction (RQ2) (Dutton and Ashford, 1993).

If the theory of quantum mechanics and the theory of communicative action qualify as a building block for a planned methodological approach (RQ2), then if the research question of whether the theory of quantum mechanics and the theory of communicative actions provide

a more complete understanding of social structures than other theories (RQ1) is therefore answered methodologically and evidenced during the experiment.

3.3.2 Move from diagnosing to countermeasures

The primary usage scenario for this mixed method approach is diagnosing to understand more complete the failures attributable to human behaviour in the organisational context. If a Habermasian ideal speech proves operational in this action research field study, then such operations can become standard operational procedures. Standard operational procedures permit ad hoc and longitudinal deployment in practice. Longitudinal deployment elevates the experimental validated diagnosing approach to an organisational change tool to increase organisational innovation power and strengthening overall organisational competitiveness.

3.3.3 Practicality for transferability

The practicability of this action research strategy depends on establishing and keeping explanatory simplifications and transferability of the shared variable approach. The experiment subjects the shared variable approach to verification procedures. The shared variable approach introduces the research question as a variable in analytical procedures. Subjective, behavioural data collected during experiment enter as values of this shared variable mathematical procedures utilised in the theory of quantum mechanics. This variable, the context, combines the sense-making of Habermas theory of communicative action with an empirical plan that provides quantum mechanical certainty for its findings. This certainty about organisational members' attitudes, desires and needs are what is missing and what is required to justify action in the researcher's current, working situation.

Pathological intentions, feelings, desires, obligations, shame, or guilt become empirically verifiable observables in language (Habermas, 1987a). This empirical verification of either pathological or somewhat healthy state of this specific, speaking and strategic acting of an organisational member mirrors the internal states of this individual. A continuing measurement of an individual's progress in pathological communication will persistently store this individual's exposed language to its external world, the world of the speaker (Axelrod, 1976). The exposure is measured by presupposing the duality of strategic action and communicative competence (Habermas, 1987; 2002). Such coexistence is logically a

superpositioned entanglement of the “simultaneously function” (Husserl quoted in Habermas, 2002, p. 29) within the individual’s mind where inclinations and desires reveal feelings and moods (Habermas, 1987a; Searle and Vanderveken, 1985). The concepts of simultaneous duality syndicate the theory of communicative action with the theory of quantum mechanics.

The syndication is adapted and the subject of this thesis analytical steps. This thesis formalism is a formalism introducing shared variables in the context of the theory of quantum mechanics and the theory of communicative action methodology. This thesis mixed-methodology represents a prototype and exemplifies how Habermasian higher dimensional pragmatics and mathematical procedures according to the lower dimensional conceptual framework of quantum mechanics lead to practical usage scenarios for probabilistic predictive analytics for behaviour in organisations (Bouchard, Giroux and Bouzouane, 2006). Thus, pathological understandings of mental states transform into a variable corresponding between the ontological layer of Habermasian sense-making and the mathematical layer of understanding the cognitive state of the organisational members. The one variable shared between the two theories approach necessitates keeping the values of variable context small and the action to deploy the formalism in practice constraint to critical, typical organisational management decision making with low probability distributions (Williams, 2002).

This thesis experiment introduces the variable “creativity” and “diversity” in one shared context between cognitive and quantum entities. The typical and critical issue that high performers leave or psychotic organisational cultures develop is regarded as an example for failures attributable to human behaviour in organisational contexts culminating in less competitive capabilities and organisational failure (Masuch, 1985).

In case analysis of the experiment results validate that the context variable “creativity” is measurable in superposition and measurable in “truth” or “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) for a hypothesised research question according to participants’ inner dynamics can other measurement of mental paths strictly following the same very basic rules of this methodology across the entire practitioner usage scenario be executed as well.

This thesis methodology encapsulates research question hypothesis test as a shared variable between higher dimensional Habermasian terms and lower dimensional quantum mechanical terms. The hypothesis confirming “truth” or the 0-hypothesis confirming “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) executes in a Hilbert space.

The experiments evidence the practical utilisation of the conceptual framework of quantum mechanics in action research field studies and evidence that researcher bias on observation can be detected and reduced (RQ1, RQ2, RQ3, RQ4).

3.4 The formalism to measure mental concepts of probability in practice

3.4.1 Introduction

This thesis new action research strategy deploys two different sets of methods to collect and quantify subjective data in the researcher’s particular organisational and work context.

3.4.2 Global intervention strategy to address a multitude of local problems proactively

Researchers’ organisational management practice serves clients and customers on a global scale. Multiple, parallel work contexts execute in different time zones, cultures, behavioural preferences, languages, changing dominating mindsets for agreed on behaviour and uncertain statements “accepted as true” (Habermas, 1987a). The unifying scheme across all differences, changes and uncertainties is the virtualised, belief based character of all work context across researcher’s globally dispersed clients and customers.

Practicality demands a many to one strategy. The many-worlds of cultures, behavioural preferences, changing dominating mindsets for agreed on behaviour and the uncertainty for the ever-changing and often contrary statements “accepted as true” (Habermas, 1987a) that makeup researcher’s globally distributed clients require the many-to-one solution. Many parallel worlds of different clients deliver the subjective observation data as values to fill multiple trajectories. All subjective data collected from different client utilise the same shared variables of higher dimensional sense-making (Kaku and O’Keefe, 1994). All shared variables utilise two different sets of methods for subjective data collection and quantification across all trajectories for interpretation and understanding.

One set of methods measure states that are direct measures of the hypothesised behavioural research question. The other set of methods measure state related to the hypothesised behavioural research questions. The latter label “superposition states” the former label “eigenvalues” in the conceptual framework of quantum mechanics. Indirect measures test if participants expose fully quantum behaviour. Participants exposing fully quantum behaviour justify further application of the mathematical formalism of quantum mechanics for this participant (Sasaki and Carlini, 2002; Behrman et al., 2006).

3.4.3 Indirect measures of the hypothesised behavioural research questions

Quantum statistical

The experiment participant is forced into three behavioural judgement situations. The first dimension is the judgement of pros and cons. The second dimension is the time dimension. The second dimension establishes a boundary condition. The experiment forced participants into three judgement situations for the same decision making context. Those three judgements separate in time in pre-judgement, vivid judgement, and post judgement.

Consistency in decision making across judgements indicates the collapse of the superposition state. A loss of superposition process dynamics indicates biasing interaction with measuring process and instrumentation. Interferences in decision making are an indicator for the persistence of decision maker state of superposition.

Traditional statistical

Conventional, statistical significance test verified that the t value exceeds critical values evidencing data per judgement situation are significantly different.

3.4.4 Direct measures of the hypothesised behavioural research questions

Measuring context

A sequence of measures executes at the level of individuals and level of groups made up of those individuals. The outcome is a particular individual's attitude to acceptance of a set of values. Those set of values prove, exemplify and increase confidence on a particular individual's behaviour, preferences for behaviour and intentions to behave in the future (Miles, Huberman and Saldana, 2013). Measures transform into scores informing about

individual or group meeting behaviours that the researcher considers essential for organisational success factors.

3.4.5 Prediction of a organisational participant future behaviour with certainty

The thesis methodology transforms researcher's subjective data collection in the real-world situation into specific measures of a specific observable logic. The observable logic is the general principle for bias-free quantification of collected subjective data. The general principle is to model in two- and many-valued logic (Tarlaci and Pregnolato, 2016; Vaas, 2001a; Bruza, Widdows and Woods, 2006; Chadha et al., 2009; Cattaneo et al., 2009; Cignoli, d'Ottaviano and Mundici, 2013; Dubois and Toffano, 2016).

Two-valued logic

This thesis methodology transforms the research question, e.g. if organisation participants and the group that is made up of such organisation participants expose behaviour considered essential for organisation success, into truth values. Truth values are 0 and 1. This specific measure results in "truth" or "falsehood" (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) if the subjective data collected matches the hypothesised research question if a participant exposes behaviour either meeting or not meeting behaviour the researcher or organisational sponsor consider desirable.

Many-valued logic

Many two-valued measures of a participant observed behaviour are combined and processed according to a minimum and maximum values. Ranking organisation success is fostering behaviour and placing many two-valued measures into this matrix result in understanding of the inner dynamics of an individual's behaviour over time and the group dominating behaviour for the group made up of such individuals.

Combining both logics into one

Bias-free prediction of this individual's future behaviour follows analytical procedures and result in geometrical thinking and Euclidian depiction of the dynamics as angular momentum.

The outcome is labelled “eigenvalue” in the formalism of the theory of quantum mechanics. Eigenvalues predict with certainty (Van Fraassen, 2016; Bruza et al, 2009). The certainty of eigenvalue hypothesis test augments the certainty of fully exposed quantum behaviour (Busemeyer, Wang and Lambert-Mogiliansky, 2009). Certainty means that if others reapply the same measures, then the same “eigenvalue” is retrieved. Certainty means that if this participant is in a comparable judgement situation applying the same logic of measurement, this will again result in the same “eigenvalue” calculation with certainty.

3.4.6 Substitute fuzzy knowledge with specific knowledge

This thesis utilisation of logic inherent to mathematical procedures of the theory of quantum mechanics substitutes fuzzy knowledge with specific knowledge (Dubois and Toffano, 2016). Mathematical procedures constitute the evidence and answer the research question that this academic theory is relevant to the researcher’s particular organisational and work context. The repeatability of general principles for quantification of subjective data establishes verification for claimed behavioural findings and justification for intervening and steering activities to change behaviour into the desired behaviour to rescue organisations (Castelfranchi, Falcone and Lorini, 2009; Dam, Nikolic and Lukszo, 2013; Masuch, 1985). Repeatability of claimed behavioural findings is precisely what the researcher’s working situation lacks and requires.

Researcher’s work situation places organisational relations into non-local context, e.g. nationwide, transatlantic and global context. Researchers’ organisational management practice serves globally dispersed clients. Clients of researcher’s customers geographically disperse, as well. A methodology for interpretation and understanding of behaviour in organisations embedded in those organisational relations require independent location methods. This thesis methodology establishes virtual research instrumentation permitting the researcher to execute different, parallel inquiries in different and geographically dispersed workplaces.

Researches work situation creates many workplaces. Understanding and interpretation of behaviour require data collection and analysis activities in many-worlds of diverse cultures, behavioural preferences, changing dominating mindsets for agreed on behaviour and

statements “accepted as true” (Habermas, 1987a). This methodology shared variable approach permits to test different research questions swiftly. Results of different research questions accumulate to deepen researcher’s understanding. All subjective data collected from different clients can utilise the same shared variables or utilise different shared variables of higher dimensional sense-making (Kaku and O’Keefe, 1994). The researcher can utilise the same methods across all globally dispersed organisations to determine if the fully quantum behaviour is exposed. The researcher can utilise the same methods across all many-worlds to receive certainty for his behavioural research questions while changing the context according to his needs. The only difference is that the values of the shared variables are different. The two set of methods shared variable approach is unchanged and meets researcher’s practicality requirements.

3.5 Equations and procedure

For simplicity of illustration, the figures are limited to illustrate equations using the Dirac notation because of its notational minimalism (Miller, Resnick and Zeckhauser, 2005). Dirac notation is a useful, effective alternative to conventional mathematical notation. It is the standard notation in quantum mechanics (Rioux, no date).

Chapter experiment and results review and explain in details the abilities exemplified on critical and typical practitioner situation requirements.

3.5.1 Initial state determination

Every participant receives a new identity. This new identity is virtual identity. The virtual identity establishes anonymity and confidentiality. Virtual participation provides contextualised disruption of the status quo (Gioia and Chittipeddi, 1991). Anonymity, confidentiality and contextualised disruption of the status quo is therefore at the disposition of the action researcher’s experimental setup.

$$Tl_{space1}Tl_{st}(Tl(Vl_v(Surrogate252@action-science2.org))) = \{|G,D\rangle, |G,F\rangle, |B,D\rangle, |B,F\rangle\}$$

Figure 3 Observed mental vectors and mental states variables

$$(ia_{GD}(0), ia_{GF}(0), ia_{BD}(0), ia_{BF}(0)) \doteq (|IA_I|^2 = 1)$$

$$(ia_{GD}(0), ia_{GF}(0), ia_{BD}(0), ia_{BF}(0)) \doteq (|IA_I|^2 = 1)$$

$$(ia_{GD}(0), ia_{GF}(0), ia_{BD}(0), ia_{BF}(0)) \doteq (|IA_I|^2 = 1)$$

$$(ia_{GD}(0), ia_{GF}(0), ia_{BD}(0), ia_{BF}(0)) \doteq (|IA_I|^2 = 1)$$

Figure 4 Amplitude reset to zero at the initial start of an experimental observation

The sample equation depicts a participant who received virtual identity Surrogate252@action-science2.org and his observed mental vectors and mental states variables (figure 3; figure 4).

Virtual identity resets prior internalised roles and influences to the level of influenced external elements set by the Habermasian ideal speech situation. Attitudes, perceptions, inner thoughts, perspectives and emotion formulate according to implications and directions set by the researcher (Koles and Nagy, 2012; Paniaras, 1997).

Each row of IA_I (figure 1; figure 4) provides the reset of measures to zero for one of the states in $TIspace1Tlst(TI(VIv(Surrogate252@action-science2.org)))$ (figure).

3.5.2 Context variables.

A questionnaire asks the same question in a different context. Three questions obtain a particular individual's preferences and intentions to behave and act.

The first question (judgement 1) obtains values for two mental vectors. The second question (judgement 2) obtains additional values for two other mental vectors. The third question (judgement 3) obtains additional values to predict future behaviour by spin theory (Pauli, 1940).

Judgement 1

Every participant is forced into conflict. The conflict forces the participant to decide on one of two possible arguments. This decision is a judgement on how to act and behave. Question 1 enforces judgement 1.

$$Tl_{space1}Tl_{st}(Tl(Vl_v(Surrogate252@action-science2.org))) = \{ |G,D\rangle, |G,F\rangle, |B,D\rangle, |B,F\rangle \}$$

Figure 5 Judgement 1 – truth values for the research question (sample instance)

This judgement (figure 5) delivers observable truth values for the research question into a vector (Vl_v) of Hilbert spaces (Tl_{space1}) (figure 1) for good (G), bad (B), defensive (D) and friendly (F) (Townsend et al., 2000; Busemeyer, Wang and Lambert-Mogiliansky, 2009).

Method:

Judgement 1 is applied as context value to the shared variable	Ranked values apply to content variable CV1
--	---

Sample instance:

If the participant categorises stereotype 1 (labelled surrogate 1) as “good”	then the CV1 is 4
If the participant categorises any stereotype (labelled surrogate) as “bad”	then the CV1 is 0

In case the 0-hypothesis confirms, ranked values are obsolete.

$$(ia_{GD}(1), ia_{GF}(1), ia_{BD}(0), ia_{BF}(0)) \doteq (|IA_I|^2 = 1) \doteq |ia_{GD}|^2 + |ia_{GF}|^2 = 1$$

Figure 6 Judgement 1 – initial amplitude distribution for the research question hypothesis $IA_I = IA_G$

$$(ia_{GD}(0), ia_{GF}(0), ia_{BD}(1), ia_{BF}(1)) \doteq (|IA_I|^2 = 1) \doteq |ia_{BD}|^2 + |ia_{BF}|^2 = 1$$

Figure 7 Judgement 1 – initial amplitude distribution for the research question 0-hypothesis $IA_I = IA_B$

Truth logic of research questions enter as shared variables and transform into projectors (figure 6, figure 7).

Judgement 2

Every participant is forced into a new conflict. The conflict forces the participant to decide on one of two possible arguments. This decision is a judgement on how to act and behave. Question 2 enforces judgement 2.

$$Tl_{space1}Tl_{st}(TI(Vl_v(\text{Surrogate252@action-science2.org})) = \{|G,D\rangle, |G,F\rangle, |B,D\rangle, |B,F\rangle\}$$

Figure 8 Judgement 2 – truth values for the research question (typified)

This judgement delivers additional observable truth values for another, different research question into another vector (Vl_v) of modified state (Tl_{st}) in augmented Hilbert space (Tl_{space1}) (figure 8).

Method:

Judgement 2 applies as context value to the shared variable	Ranked values apply to content variable CV2
---	---

Sample instance:

If the stereotype 1 (labelled surrogate 1) is acted on “friendly” by the participant	then the CV2 is 5
If any stereotype (labelled surrogate) is acted on “defensive” by the participant	then the CV1 is 0

In case the 0-hypothesis confirms, ranked values are obsolete.

Judgement 3

Every participant is forced into a new conflict. The conflict forces the participant to decide on five possible arguments. This decision is a judgement on how to act and behave. Question 3 enforces judgement 3.

Method:

Judgement 3 is applied as context value to the shared variable	Ranked values apply to content variable CV3
--	---

Sample instance:

Argument 1	“Definitely Yes”
Argument 2	“Probably Yes”
Argument 3	“Not sure”
Argument 4	“Probably No”
Argument 5	“Definitely No”
If the decision making of the participant results in “Definitely Yes”	then CV3 is 5.
If the decision making of the participant results in “Definitely No”	then CV3 is 1.

$$|A_I| = (i a_G \cdot |A_G| + i a_B \cdot |A_B|)$$

Figure 9 Judgement 3 – initial amplitude distribution for intentions to act and behave

Truth logic of research questions enter as shared variables and transform into projectors (figure 9).

$$|i a_G|^2 + |i a_B|^2 = 1$$

Figure 10 Judgement 1 states

Judgement 3 superposes between states in judgement 1 (figure 10).

3.5.3 General interference detection (GIF)

In judgement 3 the context variable is superposed between states in judgement 1 (figure 10). The context variable represents an individual that is superposed between possibilities to act and behave (Busemeyer and Bruza, 2012). This decision conflict is measurable as interference (Wang et al., 2018a; 2018b). The Interference pattern applies (Aerts and de Bianchi, (2015).

The theory of quantum mechanics measures interference as a naturally occurring mathematical and physical phenomena. This methodology applies measures to test for the presence or absence of interference phenomena in observed behaviours in organisational context (Aerts, Broekaert and Smets, 1999; Wang et al., 2018a).

The presence of interference at the time participants responded to research questions obtains two verifications. First, the certainty that fully quantum behaviour is observed (Sasaki and Carlini, 2002; Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012). Second, the certainty that research instrumentation did not interact leading to biasing interferences on the naturally occurring phenomena (Wang et al., 2018). Both measures provide certainty that applying quantum models predicting the probability of behaviour lead to practical outcomes.

This methodology transforms an empirical case of field study observed behaviours in organisations into multiple-valued two-argument logical observables in TI_{space1} (figure 1) (Tarlaci and Pregnotato, 2016; Vaas, 2001a; Bruza, Widdows and Woods, 2006; Chadha et al., 2009; Cattaneo et al., 2009; Cignoli, d'Ottaviano and Mundici, 2013; Dubois and Toffano, 2016). Predictions derived from the quantum model generate intentions to act and behave for this individual, and the group made up of such individuals (Yukalov and Sornette, 2011; Ashtiani and Azgomi, 2016; Fuller, 2018; Wendt, 2015).

Judgement 2

Judging discrepancy measures per experiment participant per judgement. If variances are high, then context variables are of known truth, validity and utility.

Method:

if a hypothesis confirming response in question 1 followed a 0-hypothesis confirming response in question 2	the discrepancy between judgement 1 and judgement 2 identifies, conflict persists, interference detected
---	--

Sample instance:

if a “good” response in question 1 followed a “defensive” response in question 2	change identifies
if a “bad” response in Question 1 followed a “friendly” response to question 2	change identifies

The larger the variance for judgement 2, the more significant the discrepancy between judgement 1 and judgement 2.

Judgement 3

Weighting expresses the degree of variance between decision making in question 1 and decision making in question 3. Weights are 0, 1, 3, 4, and 5. The smallest weight is 0, and 5 is the most substantial weight. A variance weighted as 0 represents no variance. A variance weighted as 4 represents the most substantial variance.

Method:

if a hypothesis confirming response in question 1 followed a 0-hypothesis confirming response in question 3	the discrepancy between judgement 1 and judgement 3 identifies, conflict persists, interference detected
---	--

Sample instance:

“Good” response in question 1 followed by a “Definitely Yes” response in question 3	weights 0
“Good” response in question 1 followed by a “Definitely No” response in question 3	weights 5

The larger the variance for judgement 3, the more significant the discrepancy between judgement 1 and judgement 3.

3.5.4 Applying interference pattern

In case of GIF measure confirms the observation of fully quantum behaviour, literature researched pattern of interference effects in human behaviour apply (Sasaki and Carlini,

2002; Behrman et al., 2006). In the case of GIF measure disconfirm observation of a fully quantum behaviour pattern of interference effects in human behaviour do not apply.

3.5.4.1 *Generate missing data and execute the predictive forecast*

The methodology measures participants' behaviour across time (Busemeyer and Bruza, 2012; Busemeyer, Wang and Lambert-Mogiliansky, 2009; Howard, 2000). The research question enters as a variable the mathematical formalism of the theory of quantum mechanics. The mathematical procedures result in capturing the behavioural dynamic of the participant with quantum mechanics known precision and certainty for claimed findings. The model can generate missing data to feed the four data points. The outlined analytical procedures generate missing data.

$$i_a G^2, TIEO_{DG}^2, \cos(DM)$$

Figure 11 Interference pattern parameter for prediction of post questionnaire behaviour

The four data points required for predicting analytics to forecast organisational member behaviour are FPT(G), FPT(DG), FPT(DB), FPT(A). The parameters the model requires to generate missing data are $i_a G^2$, $TIEO_{DG}^2$, $\cos(DM)$ (figure 11; figure 1).

$$|TIEO_{fg}|^2 = 1 - |TIEO_{dg}|^2 = |U_{db}|^2 \rightarrow FTP(D|G), FTP(D|B) FTP(D), FTP(G), \cos(DM)$$

Figure 12 Generate missing data and execute the predictive forecast

The equation to generate missing data and execute the predictive forecast according to scientific patterns representing hidden mental processes is $|TIEO_{fg}|^2 = 1 - |TIEO_{dg}|^2 = |U_{db}|^2 \rightarrow FTP(D|G), FTP(D|B) FTP(D), FTP(G), \cos(DM)$ (figure 12).

Method:

	Judgement 1 & 2				Judgment 3
Research question	FPT(G)	FPT(D/G)	FPT(D/B)	FPT(B)	TIEO, FPT, DM
1	XX	XX	XX	XX	Interference pattern adjustment
2	XX	XX	XX	XX	Interference pattern adjustment
3	XX	XX	XX	XX	Interference pattern adjustment
4	XX	XX	XX	XX	Interference pattern adjustment
5	XX	XX	XX	XX	Interference pattern adjustment

Figure 13 Interference pattern apply to generate missing data for non-observable, hidden mental processes.

Sample instance:

	Judgement 1 & 2				Judgment 3	Quantum model
Research question	FPT(G)	FPT(D/G)	FPT(D/B)	FPT(B)	TIEO, FPT, DM	Interference pattern adjustment to FPT(B)
1	90	70	10	10	20.00	10
2	10	0	0	90	90.00	0
3	60	10	30	40	50.00	10
4	20	0	0	80	90.00	10
5	70	50	30	30	20.00	-10

Figure 14 Interference pattern applied to generate missing data of non-observable, hidden mental processes (sample instance)

The depiction (figure 13; figure14) shows that the data to perform the focused predictive task for FTP(D) never received data from participants.

Judgement 3 applies the equation to generate missing data (figure 12; figure 13), the predictive forecast of this individual future behaviour and relates the probabilistic probabilities in the geometry of the space representing the state of mind (Bruza et al., 2009). The variable FTP(D) represents hidden mental processes decisive for an understanding and predictive analysis of an individual's behaviour. Interference pattern applied combine quantum models of hidden mental processes for conceptual combination (Aerts, 2009), perception (Atmanspacher, Filk and Römer, 2004), judgments (Khrennikov, 1999), disjunction effect (Busemeyer and Bruza, 2012), conjunction fallacy (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008), and liar paradox (Aerts, Broekaert and Smets, 1999)

Two observables input values transform in two argument logic into the shared variable TI_{space} (figure 1). One observable enters TI_{space} in five argument logic. All values transform into values of distance. The distance is predefined in TI_{space} as isometric (Khrennikov and Basieva, 2014). Isometric establishes distance-preserving and bijective relations. Distances represent the projection of observables. Projection result from combining empirical observation with the interference pattern of human behaviour.

The projection retains both arguments from two arguments logic as a bijective projection from judgement 1 and judgement 2. Observables correspond one-to-one to its two arguments logic. The two arguments logic correspond one-to-one to pairwise commutable vector (VI_v). A judgement points to one of the pairwise commutable vector (VI_v). The vector is the truth value of the research question hypothesis. The value of VI_v modifies state (TI_{st}) in augmented Hilbert space (TI_{space}) (Khrennikov and Haven, 2009). Two judgements deliver the distance between the two projections. Judgement 2 delivers the distance between projection 1 and projection 2.

The projection of judgement 3 retains all arguments from five arguments. An observable correspond one-to-one to five arguments logic. The five arguments logic correspond one-to-one to pairwise commutable vector (VI_v) (figure 1; figure5; figure 8). A judgement points to one of the five pairwise commutable vectors (VI_v). The vector is the truth value of the research question hypothesis. The value of VI_v modifies state (TI_{st}) in augmented Hilbert space (TI_{space}) (figure 1; figure5; figure 8). Two judgements deliver the distance between the two projections. Judgement 3 delivers the distance between projection 1 and projection 3.

Method:

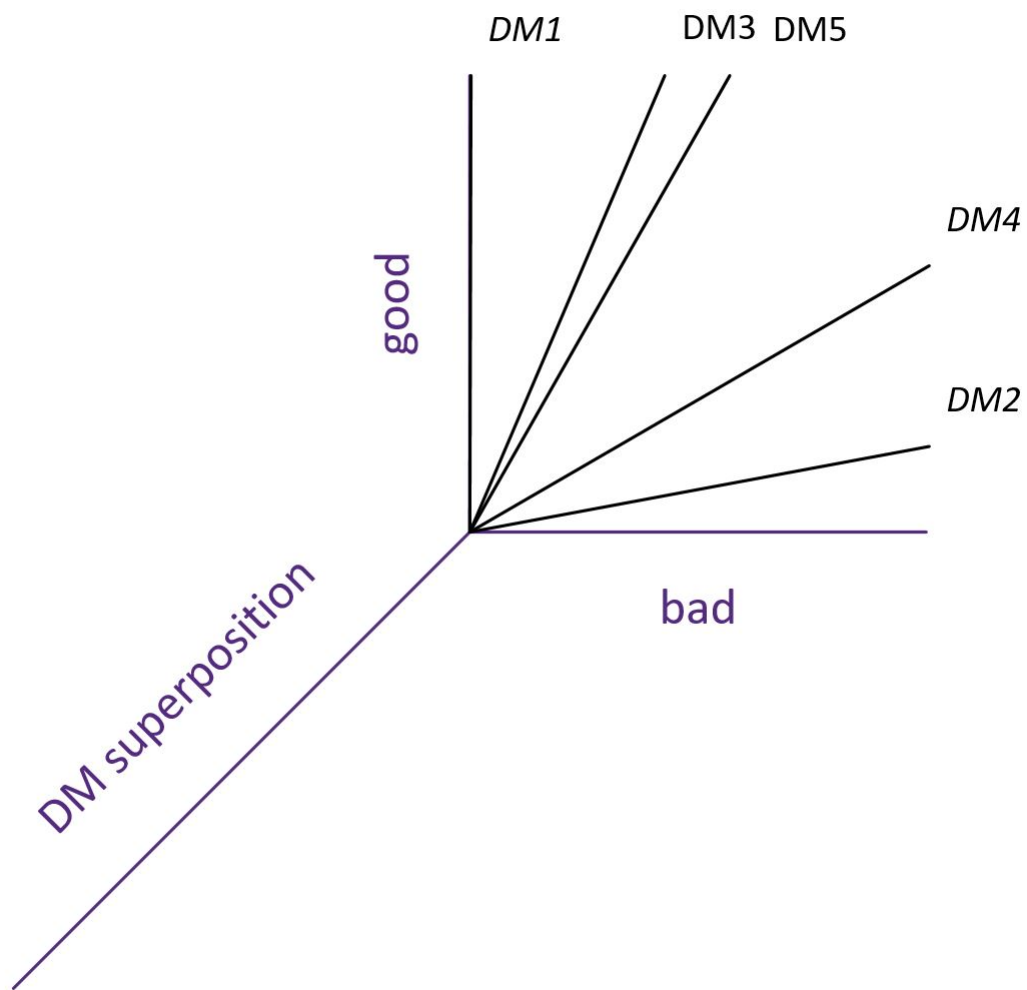


Figure 15 Quantum model prediction of vivid-questionnaire behaviour

Sample instance:

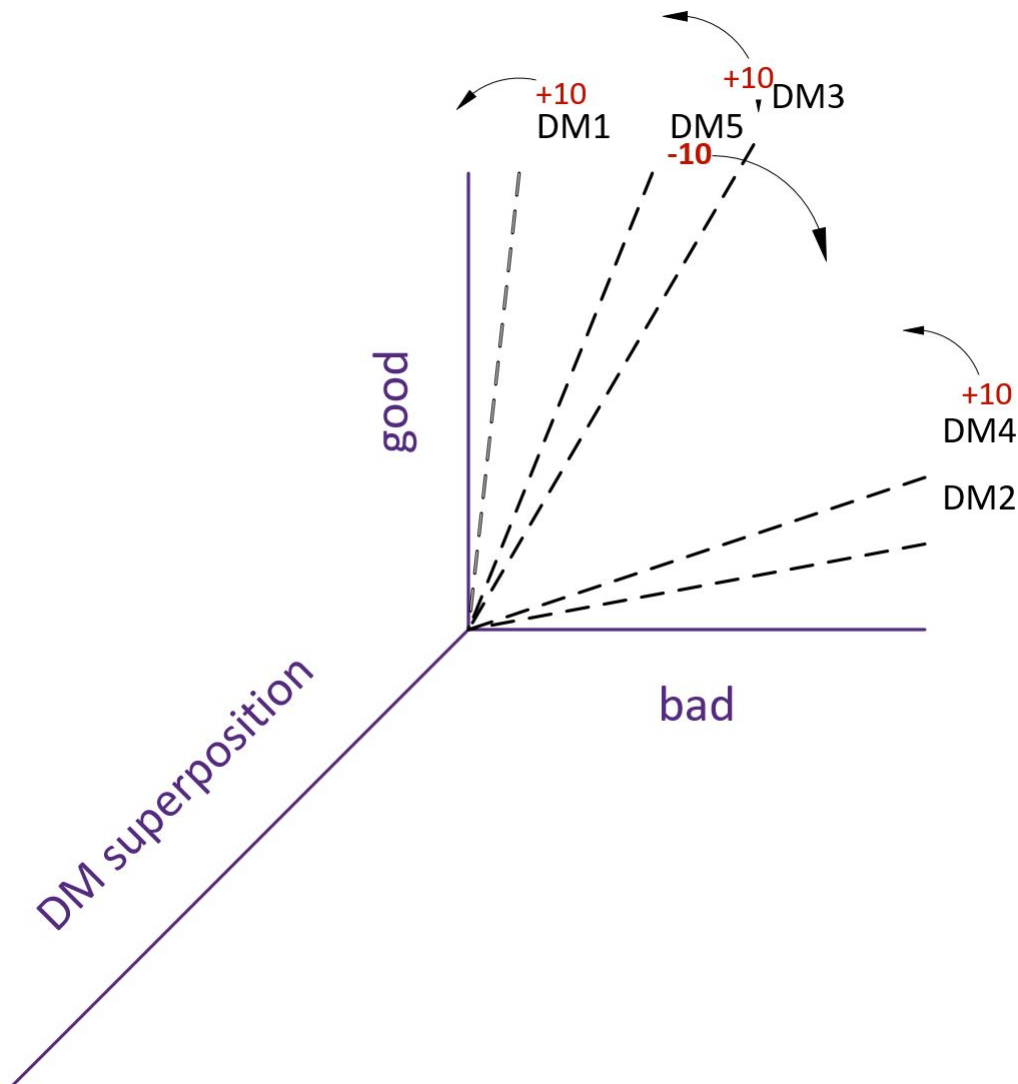


Figure 16 Quantum model prediction of post-questionnaire behaviour (sample instance)

All observables from all judgements span the space TI_{space} (figure 1; figure 5; figure 8). An observable corresponds to the difference of observation in judgement 1 and judgement 3. The difference is expressed as rotation in the 4-dimensional TI_{space} (figure 15; figure 16). The rotation occurs along coordinates and visualises an angular momentum. The momentum considers observables and non-observables. The non-observables generate. The resulting transformation of observables into observables and non-observables visualises as spin (figure 15; figure 16).

The spin is the result of three values combined in two arguments logic (figure 15; figure 16). The spin is a quantised “truth” or “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer

and Bruza, 2012) turn for the hypothesised research question posted three times to participants inform of a questionnaire. The quantised turn correlates with participants' changing behaviour (Khrennikov, 2010). Participants changing behaviour depicts geometrical as inner dynamics in Euclidian space. The hypothesised research question result in an understanding of past, vivid and post empirical case behaviour. The predicted behaviour appears as angular momentum (Dubois and Toffano, 2016; Bruza et al., 2009).

3.6 Procedures

Habermas' ideal speech situation deploys. The ideal speech substitutes the controlled laboratory, clinical environments reviewed in "meta-cycle of inquiry" (Coghlan and Brannick, 2012) literature review. The ideal speech situation encapsulates all of the researcher's inquiries and locates the action and organisational relationships in an environment where the virtual communicative action occurs. Any action this methodology outlines occurs from start to finish in the boundaries of an "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990). The questionnaire, the mathematical procedures, a bias-free collection of subjective data, quantification of subjective data and the researcher's analytical procedures require this research strategy with upfront planned instrumentation. This upfront planned instrumentation is the Habermasian "ideal speech situation".

Organisational members receive an invitation to participate. The invitation includes a function that randomly selects an email address for the participant. Participants use this email address to log in to a virtual environment, e.g. chat rooms. The chat room is managed and proctored by the researcher. Participant receives Habermas ideal speech regulations as chat room rules. Participant utilises his password to access the chat room. After participant access to the chat room, a questionnaire appears to this participant.

Organisational participants receive questionnaires. Their answers result in four combined states (figure 5). Participants are assumed to be in a superposition over those. Those states evolve across the duration of their participation in the Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990).

3.7 Summary

The research questions received clear answers. The mathematical procedures applied to utilise a two-state, time-symmetric approach specifically design to weakening interaction effects on outcomes (Atmanspacher, Filk and Römer, 2004; Wang et al., 2018b; Ashtiani and Azgomi, 2016). The effects of prediction with certainty arise naturally (Aharonov and Vaidman, 2008). This chapter places the methodology and research design in the context of the research questions.

3.8 Ethics

3.8.1 Ethical standards

Ethical standards apply to experimental-phase participant recruitment and for the information collected from recruited participants aimed to design technical risk management for data collection and data analysis phases of this study. The methodology applied by the researcher during the experiment was to use multiple sources: the existing client base of the researcher, internet focus groups on LinkedIn, and informal networking. Upfront-populated procedures described data collection procedures and anonymisation of the data analysis.

3.8.2 CAMES Experiment Privacy

Privacy risks addressed via strong adherence to ISO 26362:2009 (ISO 26362, 2009), ISO 20252:2012 (ISO 20252, 2012) and ESOMAR guidelines (ESOMAR, 2011) for online research. A non-probability sampling design had been chosen to recruit respondents and executed by ISO 26362 (ISO 26362, 2009) (Cames, 2014). Data collection processes were monitored to ensure they carried out as intended and for impact on accuracy and consistency of the data (Cames, 2014) by ISO 20252 (ISO 20252, 2012) and ESOMAR (ESOMAR, 2011).

Participants had the option either to provide their consent e-form signature or to indicate consent in the actual questionnaire. Participants further had the option to provide their name or to disguise their name and other hints that would indicate their real-world identity by utilising CAMES inherent and automatic provisioning of virtual identities to the extent that even the researcher cannot map the virtual identity to the participant. Anonymization assured via three security access levels; user identity passwords, application identity passwords, and data access passwords and by referencing the participant further on by the assigned or selected virtual identity only that had been either randomly assigned by researcher or picked by research participant himself out of a pool of more than 250 listed virtual identities. These virtual identities are internet addressable email addresses allowing to further communicate with researcher and another experiment participant by anonymised means.

Deducing participant identity is impossible as no storage of demographic details occurs and data collection mechanism is disabled. Virtual identities, temporarily assigned to

experiment, participants, are disabled before data analysis, establishing irreversible de-identification.

Experiment part1 participants recruited via an email authorisation from C-level personnel of real-world private organisations, granting permission for access to participants via their company assigned email. The researcher had asked top organisational management to provide a distribution list for the research invitations that would meet the requirement, defined as belonging to organisational management staff. No email distribution on the researcher's behalf occurred, and no other assistance provided, e.g. no access to participants, no facility use, and no use of personal time for research. Experiment part 2 participants were recruited via an anonymised professional organisational manager group, online. Both recruitments have data collection routines applied that are separate from participants' regular activities.

Experiment participants received an 'opt-in' and 'opt-out' option. This option address concerns of potential coercion threats and underlying assumptions of implied consent. Knowledge gain, option to receive the study results and further 'opt-ins' for additional experiment's' participation on the voluntary basis established a conflict-of-interest-free and coercion-free environment without pressure to participate or obligation to finish the study. Technical controls established compliance in risk management per ISO 20252:2012, 4.7.2 and 4.9.2 (ISO 2012, 2012), ensuring security and confidentiality of personal, private information, and data. The researcher not inhabited any dual roles were participation recruited. Participants recruited on a voluntary basis without any possibility of coercion threats by the researcher.

3.8.3 CAMES Experiment Confidentiality

Data are secured via Microsoft Azure Data storage protection mechanism for the 5-year data retention period, requiring three levels of password protection, e.g. via user identity passwords, application identity passwords, and data access passwords ensuring protection on electronic files and locks for physical data access.

Chapter 4: Experiment

4.1 Introduction

This experiment focuses on the possibility of a multidisciplinary approach by assessing if experiments performed in a clinical set up in mathematical psychology and decision science qualify for bias-free collection and quantification of subjective data in researcher's particular organisational and work context.

This experiment seeks evidence that this thesis methodology bias-free collects subjective data in project field studies to establish mental concepts and analysis of human behaviour in a researcher's particular work context.

This experiment adopts a parameter-free 4-dimensional quantum information processing and performs verification efforts for claimed evidence that this thesis novel action methodology is the action the researcher's working situation requires.

The empirical study focuses on project managers, due to the project-focused environment in the company from which data is collected.

4.2 Cycles of Action, Reflection and Sense-making

This "meta-cycle of inquiry" (Coghlan and Brannick, 2012)" (Coghlan and Brannick, 2012) experiment conduct various inquiries simultaneously. The inquiries translate researcher ideas and academic discussions into action. Both inquiries generate verifiable evidence to answers the research questions. The findings of this "meta-cycle of inquiry" (Coghlan and Brannick, 2012) experiment critically review in "meta-cycle of inquiry" (Coghlan and Brannick, 2012) results.

4.2.1 Inquiry focus 1: Theory

This inquiry focus applies verification procedures validating if the theory of quantum mechanics and the theory of communicative actions provide an improved understanding of human behaviour in the researcher's particular organisational and work context.

Translation of complex ideas into action

This inquiry performs the complexity of translating the theory of quantum mechanics and the theory of communicative ideas into action.

4.2.2 Inquiry focus 2: Terrain mapping

This inquiry focus applies verification procedures validating that this thesis new action science research methodology is the action the researcher's working situation requires.

Translation of complex academic discussions into action

This inquiry performs the complexity of translating numerous academic discussions in mathematical psychology, cognitive sciences, action-science, action-research and organisational sciences reviewed in "meta-cycles of inquiry" (Coghlan and Brannick, 2012) literature review into action.

4.2.3 Action involved

Action location

This "meta-cycle of inquiry" (Coghlan and Brannick, 2012) experiment locates the action of inquiry focus 1 and 2 in two distinct experiments, both representing researcher typical and critical organisational and work context.

Action 1

Plausibility tests produced evidence

Action 2

Verification procedures for claimed findings executed alongside evidence creation.

4.3 Experiment Conception

The experiment focused on critical, typical project behaviour measurable in action, also, in detecting participant preferences for action and forecasting participant's future intentions to act.

Two experiments in mathematical psychology evidenced successful application of quantum mechanical procedures in measuring behaviour in action, identifying preferences and future

intentions to act (Townsend et al., 2000; Busemeyer, Wang and Lambert-Mogiliansky, 2009). Those experiments had been reviewed during “meta-cycle of inquiry” (Coghlan and Brannick, 2012) literature review and chosen as a scheme for this experiment.

Townsend’s et al. (2000) facial stimuli had been substituted and replaced by non-emotional reading and language stimuli in an emotional categorisation and decision-making situation with realistic project communication stimuli (Townsend et al., 2000; Busemeyer, Wang and Lambert-Mogiliansky, 2009). Participants received narrative stereotype perceptions that produced a four-dimensional Hilbert space hosting pairs of associated binary vectors permitting Hilbert space representation of the first perceptual relations between stereotypes and categories.

This experimental thesis setup utilised categories as stereotype-related information. These categories are labelled Surrogate1, Surrogate2, Surrogate3, Surrogate4, and Surrogate5 and result in an easy-to-process complete summary of five labels. The experiment utilises stereotypic action-meaning attribute trait categories “defensive” and “friendly” to establish associated states and consequently link behaviours in an easy-to-use and non-communicative questionnaire.

These stereotypes are utilised to enforce the participant into three judgments situations. Those judgments force the participant to act by making a decision. This action produces interferences. Interference effects on human choices are observable and measurable. (Andersen, Klatzky and Murray, 1990). The observed interference is therefore expected and considered quantum mechanical expressible as 4-orthonormal basis vectors and detectable in human communicative sets.

Evidence that vivid human behaviour, human preferences for behaviour and human intentions to act in the future are measurable are numerous, i.e. for conceptual combination (Aerts, 2009), perception (Atmanspacher, Filk and Römer, 2004), judgments (Khrennikov, 1999), disjunction effect (Busemeyer and Bruza, 2012), conjunction fallacy (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008), and liar paradox (Aerts, Broekaert and Smets, 1999). Such laboratory, clinical experiment evidenced quantum mathematical procedures predicting human behaviour with certainty. This experiments new action science methodology builds on scientific evidence for the

macro presence of Heisenberg's uncertainty principle and applicability of mathematical measuring procedures according to the Copenhagen wave collapse to discover hidden postulated trajectories (Bohm, 2012) and apply researcher's interpretations as cognitive schematizing in a Euclidean sense (Habermas, 1973). Furthermore, these experiments adopt but significantly modifies analytical measuring procedures evidenced to have successfully applied the theory of quantum mechanics to explain and quantify human communicative action (Bohr, 1958; Tuszynski, 2006; Wigner and Margenau, 1967 cited in Tarlaci and Pregnolato, 2015).

This thesis experiment seeks verifiable evidence that bias-free collection of subjective data and bias-free principles for quantification of human behaviour existed and occurred in this experiment part 2 in critical and typical real-world situation by applying this thesis novel methodology. This evidence is what the researcher's current, working situation requires. Evidence that a claimed finding of human behaviour is correct is key to justify interfering initiatives and steering interventions that may rescue projects failing because of human misbehaviour.

This thesis new action science methodology entangles different quantum mathematical procedures with the theory of communicative action. The resulting solution deploys as Habermas "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990). The test executes in a Habermas "ideal speech" deployment in a critical and typical researcher work context.

Experiment part 1 applies verification procedures validating that a research design combining the conceptual framework of quantum mechanics and theory of communicative action proofs practical to ensure participants anonymity, confidentiality and easy adoption by organisational management practice.

Experiment part 2 adapts findings from part 1, repeats the inquiry of experiment part 1 but locates the action in different organisational relation to confirm and establish confidence for findings in experiment part 1.

Experiment part 2 adds critical project behavioural context and certainty for its claimed findings.

4.4 Purpose of the experiment

Experiment participants have been presented all stereotypes and categories for the available characters available during the virtual anonymity guaranteeing experimental setup (Dahms, 2004). Afterwards, participants had to decide in a Q&A survey monkey session about their interaction decision.

The purpose of field study experimentation is to establish general principles for a methodology collecting subjective data in project field studies to establish mental concepts and analysis of human behaviour in organisational context. The buildup of quantitative models of the human mental states of the project and organisational members foster a more complete understanding of the dynamics of human behaviour and therefore the dynamics of projects. Enhanced understanding of project dynamics results in early warnings and alarming organisational management to intervene in such dynamics for a more complete satisfying outcome.

Beneficiaries are project sponsors or organisational investors. A methodology providing verifiable certainty for claimed findings justify intervention and steering action.

4.5 Procedures

Participants were given the questionnaires to preserve the approach of two clinical studies for Category-Decision Making and to evaluate if clinical results can be a) ported over into the realm of project management and b) allow applying four data points into quantum formulas for the behavioural forecast. Experiment participants have been presented all stereotypes (perception) characters available during the experiment. Afterwards, participants had to decide in a Q&A survey monkey session about their interaction decision (Busemeyer, Wang and Lambert-Mogiliansky, 2009). Two scenarios were set up for the categorisation then decision, the so-called C-then-D condition, and with small alternations for the conditions at the beginning of two experiment session (Busemeyer, Wang and Lambert-Mogiliansky, 2009).

This thesis experiment part 2 experimental tests if the conceptual framework from the theory of quantum mechanics and discussions in academic literature in mathematical

psychology and mathematical procedures in decision science experimental setups can be adopted, revised and refined to meet what the work situation of researcher requires. This thesis experiment part 2 translated this idea into communicative interaction in a particular typical and critical researcher work context (Habermas, 2002).

Researcher transforms the complexity of those theories by establishing an actionable scenario measuring an individual's behaviour in a pre-judgement, a vivid judgement and a post-judgement scenario embedded in a Habermasian ideal speech deployment. The participant is forced to use his virtual identity inside the Habermasian ideal speech situation to reveal his behaviour, his preferences for behaviour and his intentions for future behaviour in regards to the stereotypes.

The stereotypes represent individuals of different levels of creativity. Stereotype 1, labelled surrogate 1, represents highly competent, visionary levels of creativity. Stereotype 5, labelled surrogate 5, represents the opposite of stereotype 1. Stereotype 5 represents a less competent, obedient, and no risk taking follower. Stereotypes 2-4 represent different grades in the same context.

Participants' responses enter as variables in the mathematical formalism of the conceptual framework of the theory of quantum mechanics. The known capacity of the theory of quantum mechanics to predict with certainty applies to the answers of participant introduced as variables into the mathematical formalism of the theory of quantum mechanics. Values of variables that become subject of mathematical formalism in the theory of quantum mechanics are labelled eigenvalues. The Habermasian ideal speech situation measures if the participant exposes quantum behaviour. Quantum behaviour positively detects if the participants are in superposition for his action decision. Experiment part 2 represents the action, and the process of the action establish proof if the quantum behaviour is exposed. Only if the quantum behaviour is measured as present are eigenvalues calculated for the participant. The conditional proof establishes the certainty of claimed findings required to justify intervention initiatives.

Participants were not given any cues nor associated probabilities in advance nor during experiments. Both experiments kept the stimuli and the questionnaires on different pages in the survey monkey questionnaire design. Finishing reading of the stimuli pages caused

categorisation questions to appear on another questionnaire page while removing the stimuli information from the screen display. Responses to categorisation questions caused the decision questions on the next questionnaire page to appear while removing the stimuli information from the screen display. Decision responses caused new, different decision questions to appear on another questionnaire page while removing the former decision questions from the screen display. Removing the former decision questions from the screen display kept the original and sequence-initiating stimuli as a memorised repository as the stimuli were not presented simultaneously with the questions, instead of requiring a sequential scroll back.

That the stimuli were not presented simultaneously with the questions constitutes another significant departure and enhancement from Townsend's (Townsend et al., 2000) experimental setup where stimuli were always present on the same page. Such a sequential scroll back only occurred in $\leq 5\%$ of part 1 participants and $\leq 8\%$ of part 2 participants. That this occurred in $\leq 5\%$ of part 1 participants and $\leq 8\%$ of part 2 participants only indicates that emotional responses by participants as vividness fosters retrievability and availability of specifics better than actions that are unemotional exposures of automatic awareness without conscious (Bazerman and Moore, 2008).

Responses attribute to the experimental stimuli and not to past measures of equal frequency as recency and vividness establish ease to recall from memory. Any questionnaire following scroll back activity that would have introduced indicators for non-recent, non-vivid occasions of less easily recalls only occur non-significant and non-interfering (Bazerman and Moore, 2008).

The experimental setup of this thesis utilised stereotypes as stimuli and triggered the participant's ordinary mental processes of categorisation, perception and memory. Triggering the same ordinary mental processes in a critical, typical real-life project situation confirms that it is possible to translate quantum decision science clinical experimental setups into the realm of the practitioner in project management. Triggering the same ordinary mental processes without researcher imposed biasing decision-making feedback and without incentive influences for desired interaction decision making and categorisation constitutes another significant difference this thesis experiment introduced as both

Townsend and Busemeyer (Townsend et al., 2000; Busemeyer, Wang and Lambert-Mogiliansky, 2009) interfered via positive enforcements and provisioning of incentives for experiment participation. This thesis experiment did not positively enforce and did not provide incentives to participate.

4.6 Experiment part 1

Experiment part 1, conducted in April 2016, consisted of 194 globally dispersed experienced project managers located in Germany, U.S.A., India, UK, and France resulting in 5 trials per person for 23 persons and a sample size of 115 (N=115). All 23 participants were professional project managers. Participants received a new virtual identity and online access to the questionnaire. The questionnaire completed with an average completion time of 7 minutes. Researcher created in advance 300 email addresses from a domain owned by the researcher. Researcher distributed those inside the questionnaire per randomised features. Part 1 tested if virtual identities establish anonymity and confidentiality and do so in a practical, low cost, straightforward process.

4.7 Experiment part 2

Experiment part 2, conducted between August – September 2016, consisted of 319 experienced project manager located in Germany, U.S.A., India, UK, and France resulting in 15 trials per person for 11 persons and a sample size of 165 (N=165). All 11 participants were professional project managers. Participants received a new virtual identity and online access to the questionnaire. Researcher created in advance a new set of 300 email addresses from a different domain than the domain used in experiment part 1 owned by the researcher. Participants received a new virtual identity and online access to the questionnaire. The questionnaire completed with an average completion time of 10 minutes.

4.8 Reflection on the action in the experiment

Reflection on the action in experiment part 1 revealed that action crucially depended on researcher handling himself in practice explaining the action idea in a particular work

context to a top manager in charge of a particular organisation's global project management office practice.

Researcher changed experiment part 2 for plausibility testing. Experiment part 2 executed similarly to experiment part 1 with the exception that researcher did not involve convincing particular work context top manager in charge of a particular organisation's global project management office practice. Plausibility tests changed to recruit a project manager not coming from a particular, specific organisation's global project management office practice.

Researcher himself translated ideas into action in a particular social media context vs particular work context. Experiment part 2 executed in a project manager LinkedIn environment with participants from 5 continents. Experiment part 2 therefore experimental evidenced that alternative "meta-cycle of inquiry" (Coghlan and Brannick, 2012) might be required in case of experiment part 1 top management support dependencies are either not existing or turned into the opposite, defined as top management sanctioning the action response or proposed courses of action.

Experiment part 2 further changed from experiment part 1 by modifying experimental evidenced considerations of states. Part 1 considered current state from one past, one prior state. This thesis experiment part 2 established prior-judgement, current judgement and post-judgement measurements capturing the inner dynamics of individual decision making.

Given the same rationale, this experiment did apply actual measurement results for the "good" or "bad" category and the "friendly" or "defensive" decision action as such results help with the research question. Of importance is proof that laboratory or thought experiments in decision science are portable from their clinical environment into the real world of the project and organisational management. Important is if researcher bias or interaction of research instrumentation can be reduced or eliminated via the theory of communicative action concepts. If the principles can be applied that verified in Townsend and Busemeyer, e.g. utilizing Busemeyer's 4-dimensional quantum modelling with four parameters $\{|q_G|^2 = p_G, \mu_G, \mu_B, \gamma\}$ from four data points $\{\Pr(G), \Pr(D|G), \Pr(D|B), \Pr(D)\}$ generating interference effects, then can this experiment conclude with success in answering the research questions (Townsend et al., 2000; Busemeyer, Wang and Lambert-Mogiliansky, 2009). Of importance is that such adoption results in a Habermas "ideal speech

situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) that can be used for different inquiries and is portable to locate the action in different organisational relations, as experiment part 1 and experiment part 2 evidenced.

This thesis experiment did not introduce a researcher biased stimuli perception, did not influence participants in their categorisation, did not test if a decision depends on the original stimuli or is root caused by categorisation. Given these research questions were the subject of other clinical experiments already, this thesis experiment focused primarily on the possibility to adapt and transform proven clinical category-decision research into the realm of practitioner environments.

Given this rationale, no test has been performed to validate the Markov prediction nor the appropriateness of the law of total probability (Busemeyer and Bruza, 2012). This thesis instead builds on the findings of the Townsend (2000) and Busemeyer et al. (2009) experiments evidencing that state transition probabilities are influenced by preceding, past, and previous fragments of a multiplicity of simultaneously coexisting trajectories and not solely dependent only on the current state or states that are reachable solely via actions of the current state (Russell et al., 2003; Burke and Kendall, 2005).

4.9 Materials

Closely following Townsend et al. (2000), Busemeyer et al. (2009) and Dahms (2004), the scenario had been set-up for part 1 and part 2 using instructions. Participants received researcher designed Survey Monkey questionnaires for part 1 and part 2 of the experiment. Both experiments provided identical perception-categorisation (P->C) questions.

Experiment part 2 participants delivered, in addition to perception-categorization (P->C) and categorization-decision (C->D) responses, decision-decision (D->D) responses as well. Part 2 experimental testing is, therefore, another enhancement from the original Townsend (2000) setup as C->D->D decision chains have not been targeted in Townsend (2000) nor Busemeyer et al. (2009) experiments nor by any other decision science experiment utilising quantum decision sciences methodologies.

4.9.1 Sampling strategy

Both experiments were primarily qualitative sampling oriented. Critical and typical cases have been selected exemplifying essential findings to increase confidence in conclusions.

The research questions construct planned interactions between participants. Episodes construct according to formalism in theory of quantum mechanics and formalism in theory of communicative action. Both experiments provided identical perception stimuli, defined as project participant stereotypes based on a modified version of the Association of American Universities role play on project management (Dahms, 2004). Representativeness and generalisations of findings to settings not utilising formalism in theory of quantum mechanics and formalism in theory of communicative action are not driving sampling strategy (Miles, Huberman and Saldana, 2013).

4.9.1.1 Selection criteria for participants

The selection criteria for participants is upfront theoretically driven, iterative and descriptive.

Experiment participants in the first experiment differ from experiment participants in the second experiment in four aspects. They differ in people, place, moment and instance. This difference and the diversity between experiment 1 and experiment 2 participant is conceptual driven to evaluate the universality of Habermasian “ideal speech” and clarify the main pattern, the interference pattern.

Experiment participants in the first experiment match experiment participants in the second experiment in one aspect. This resemblance is the participants work assignment and experience in an organisational context as project manager. The first experiment consists of 194 experienced project managers and the second experiment consists of 319 experienced project manager.

Both experiments permit to select a commonly shared variable as descriptive meta-matrix. This shared variable is the context between higher dimensional Habermasian terms and lower dimensional quantum mechanical terms. Descriptive data from both cases establish a clear matrix order according to the shared variable examined. Thus, can the selection criteria for participants differ as long as common main variables across all cases establish iterative plausibility testing evidencing an alternate course of actions exist. These selection criteria

and this sampling strategy results in multiple case study order according to shared variables and extend coherent arrays for the shared variable across all cases (figure 25; figure 26) (Miles, Huberman and Saldana, 2013).

4.9.1.2 Irrelevant

Traditional quantitative research techniques like a random selection, control groups and traditional qualitative research techniques like concealing and camouflaging the initial setup conditions are a priori irrelevant for the researcher particular working context. The validity of this thesis action science methods does not depend on the result of experiments in the area of social sciences, organisational sciences, physics, or medicine or of any other domain of science (Aerts and Aerts, 2008). Negative or positive categorisation of participants, quantitative or qualitative research techniques are irrelevant for experimental verification if Habermas “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) is relevant for this thesis particular work context and to what extent practical for many, other organisational environments (Ross and Chiasson, 2011; Adams, 1996). Habermasian ideal speech is judged as too utopian and impractical (Alvesson and Willmott, 1992; Hirschheim and Klein, 1994; Metcalfe, 2002). The practicality of Habermasian ideal speech and Habermas theory of communicative action beyond this thesis experiment specific context is out of scope.

4.9.1.3 Relevant

Relevant is ensuring the results of this experiment are transferable into the realm of subjects experiencing project and organisational management. Relevant is that this action research results in instrumental anonymity for participants. Anonymity for participants reduces the risk for participants becoming the target of bullying by colleagues or supervisors for their action to join this action research. Verification of instrumental anonymity ensuring participant anonymity and confidentiality across setting, the subject of this experiment, confirms transferability of the research instrumentation this action research produced to other context and other settings.

Relevancy has been critically tested by porting instrumental anonymity into the different setting by keeping same initial setup procedures. Experiment part 1 tested if is this thesis

action research instruments and approach can be implemented for action in an organisation by a convincing stakeholder of this organisations. Experiment part 1 tested in an environment where a vice president in charge of global project management office recommended participation in this experiment to their more than 250 globally dispersed project managers.

Experiment part 2 tested if is this action research instrumental anonymity for participants can implement without convincing stakeholder of an organisation. Experiment part 2 tested actions may require where working situation involve sanctioning this action research course of action. Experiment part 2 tested in a project manager LinkedIn environment with participants from 5 continents.

4.9.2 Instructions to participants

Instructions to participants for part 1 and part 2 for the non-emotional reading and language stimuli presenting narrative stereotype perceptions read (Dahm, 2004):

“You have been chosen by the UN to become the PM for an international project team, and your task is to assemble the very best out of an already existing project team for further consideration in your dream-team. The team is therefore by you to be divided into two groups via two simple categories (good/bad).

Group 1: The ‘Good’ team (called ‘Kodak’ Team)

or

Group 2: The ‘Bad’ team (called ‘Skrols’ Team)

Before you interact with the project participants, you will be first asked to categorise each project participant as either ‘good’ or ‘bad’.

You have up to 3 Minutes to view all roles (you may answer before the 3 minutes are up). For every role categorise in either Good OR Bad.”

4.9.3 Roles

Surrogate1

You are punctual, structured and systematic in your approach. You are also very ambitious and like to work hard – a kind of workaholic!! You dislike the relaxed attitude of your colleagues 2, 3 and 4, you find them lazy and are trying hard to push them to work harder. You are also not particularly happy about the attitude of 5 because you do not perceive the supervisor as a very competent researcher and find that your own ideas for the project work are much better than his.

Surrogate2

You are late for the meeting because you met a friend and took the time to have a nice chat with him even if you knew that you would be late for the group meeting. Your excuse for not having done the agreed-upon task is that you had to take care of some problems for a neighbour in your hostel who needed a helping hand and then time slipped away. You are not worried about the approaching deadline – somehow things will fall in place. You like very much to discuss all sorts of diverse topics, weather sports, film, girls etc.

Surrogate3

You are very self-assured, ambitious and would like to make a good project report but you get carried away with the never-ending discussions initiated by Surrogate2 because you cannot accept him getting the last word in a discussion because you think yourself smarter than him. You find 1 very annoying in his bossy attitude and you perceive 5 as a shy person. You have not completed the agreed-upon task and have not brought any papers to the meeting. The reason for not having completed the task is that you are not yet satisfied with the result of your work and therefore do not want to present it to the other group members, in case they might criticize your work.

Surrogate4

Your excuse for turning up late for the meeting is that you overslept because you were out late last night. You have a lame excuse for not having made the task agreed upon – something about having not felt so well for a few days and therefore you could not work. You are very sociable and want everybody to feel good, but you are not prepared to work very hard and feel that being a Surrogate should be more fun and less hard work.

Surrogate5

You do not feel comfortable in the group and find most of your colleagues to be impolite because they talk in class and sometimes turn up late for classes and group meetings. You are also puzzled by the lack of respect that the others show towards the supervisor. You do not agree with the time schedule proposed by 1 – you would feel much more comfortable if the group would only follow the advice of the supervisor. You have actually prepared the task you were supposed to prepare but do not want to present it to the other group members before the supervisor has had a chance to correct it for you.

4.9.4 Perception-categorization (P->C) questions

The following instructions received experiment part 1 as well as experiment part 2 participants:

“You now need to categorize each surrogate as either ‘good’ or ‘bad’, regarding their suitability as a project manager. If you rate a surrogate as 'good', this suggests that you would include them in your project 'dream team'. Please spend no more than three minutes completing this exercise. It is important for the study that you give us your immediate reaction.”

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Q11: Please categorise Surrogate 1 as one of the following:	Good
Q12: Please categorise Surrogate 2 as one of the following:	Bad
Q13: Please categorise Surrogate 3 as one of the following:	Bad
Q14: Please categorise Surrogate 4 as one of the following:	Bad
Q15: Please categorise Surrogate 5 as one of the following:	Good

Figure 17: Part 1 participants delivered perception-categorisation (P->C) (depiction shows a sample of an anonymised participant response)

* 14. Please categorise Surrogate 1 as one of the following:

- ☐ Good
☐ Bad

* 15. Please categorise Surrogate 2 as one of the following:

- ☐ Good
☐ Bad

* 16. Please categorise Surrogate 3 as one of the following:

- ☐ Good
☐ Bad

* 17. Please categorise Surrogate 4 as one of the following:

- ☐ Good
☐ Bad

* 18. Please categorise Surrogate 5 as one of the following:

- ☐ Good
☐ Bad

Figure 18: Part 2 participants delivered perception-categorisation (P->C) (depiction shows a sample of an anonymised participant response)

4.9.5 Categorization-decision (C->D) questions

PAGE 10: PARTICIPANT QUESTIONNAIRE - Part 2

Q19: Please categorise Surrogate 1 as one of the following:	Defensive
Q20: Please categorise Surrogate 2 as one of the following:	Friendly
Q21: Please categorise Surrogate 3 as one of the following:	Defensive
Q22: Please categorise Surrogate 4 as one of the following:	Friendly
Q23: Please categorise Surrogate 5 as one of the following:	Friendly
Q24: Do you want this person as a member of your dream team: Surrogate 1	Definitely "Yes"
Q25: Do you want this person as a member of your dream team: Surrogate 2	Definitely "No"
Q26: Do you want this person as a member of your dream team: Surrogate 3	Probably "Yes"
Q27: Do you want this person as a member of your dream team: Surrogate 4	Probably "No"
Q28: Do you want this person as a member of your dream team: Surrogate 5	Definitely "Yes"

Figure 19: Categorization-decision (C->D) questions for experiment part 1 (depiction shows a sample of an anonymised participant response)

* 19. Please categorise Surrogate 1 as one of the following:

- ☐ Friendly
- ☐ Defensive

* 20. Please categorise Surrogate 2 as one of the following:

- ☐ Friendly
- ☐ Defensive

* 21. Please categorise Surrogate 3 as one of the following:

- ☐ Friendly
- ☐ Defensive

* 22. Please categorise Surrogate 4 as one of the following:

- ☐ Friendly
- ☐ Defensive

* 23. Please categorise Surrogate 5 as one of the following:

- ☐ Friendly
- ☐ Defensive

Figure 20 Categorization-decision (C->D) questions for experiment part 2 (depiction shows a sample of an anonymised participant response)

4.9.6 Decision-decision (D->D) questions

24. Do you want this person as a member of your dream team: Surrogate 1

- ☐ Definitely "Yes"
- ☐ Probably "Yes"
- ☐ Not sure
- ☐ Probably "No"
- ☐ Definitely "No"

* 25. Do you want this person as a member of your dream team: Surrogate 2

- ☐ Definitely "Yes"
- ☐ Probably "Yes"
- ☐ Not sure
- ☐ Probably "No"
- ☐ Definitely "No"

* 26. Do you want this person as a member of your dream team: Surrogate 3

- ☐ Definitely "Yes"
- ☐ Probably "Yes"
- ☐ Not sure
- ☐ Probably "No"
- ☐ Definitely "No"

* 27. Do you want this person as a member of your dream team: Surrogate 4

- ☐ Definitely "Yes" **!**
- ☐ Probably "Yes"
- ☐ Not sure
- ☐ Probably "No"
- ☐ Definitely "No"

* 28. Do you want this person as a member of your dream team: Surrogate 5

- ☐ Definitely "Yes"
- ☐ Probably "Yes"
- ☐ Not sure
- ☐ Probably "No"
- ☐ Definitely "No"

Figure 21: Decision-decision (D->D) questions for experiment part 2

4.10 Design

All participants placed at their office or home locations or any other location of their choice utilising internet connectivity. There were no device restrictions so participants could use mobile devices (iOS, Android, Windows and Windows 10) or company assets (PC/Mac) to access cloud-based SAA (Software as a Service) applications the researcher utilised. The researcher utilised surveymonkey.com for questionnaires and rightsignature.com for e-sign

of the consent form. The latter offered as a PDF file attachment for manual signature and email or fax return procedures in addition to e-sign for a consent form.

4.10.1 Experiment participants part 1 instructions

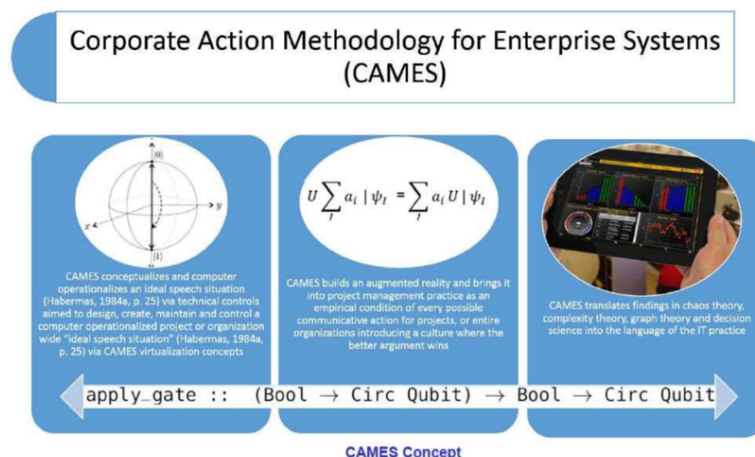
For part 1 of the experiment participants received the following instructions where every participant had the opportunity to ask questions at or before the start of the survey monkey session.

Dear Experiment Volunteer,

Many thanks for considering to join this study, which is an investigation into the factors which impact upon project success aimed to research quantum computing augmented intelligence tools for project management.

Your participation is entirely voluntary, and you can leave the study at any time. We estimate that in total the study will take no more than 30 minutes of your time. All data will be held securely and the results will be presented as summary, anonymised data. All of your answers will be confidential and it will not be possible for you to be identified.

We hope you'll enjoy taking part in the study, which we believe will help us gain a better understanding of the reasons projects fail, and how we might address these. We are particularly interested in the human factor, and issues of communication to apply quantum models of decision making and utilize Quantum-like Representation Algorithm to visualize Quantum-like Projection of Mental Reality. Experiment participants of phase 3 will have the opportunity to interface with the quantum computing augmented intelligence tool developed.



The experiment consists of three parts; as outlined below.

Part 1 (April 2016) is a short introductory study. You will be presented with descriptions of five stereotype project managers.

You will then be asked to categorise each one as either a "good" or a "bad" project manager.

Experiment Sign-Up procedures

Your anonymity is key to ensure an ideal speech situation where the better argument wins.

You receive a new virtual identity that will ensure your real-world identity is not revealed to other experiment participant during the course of the experiments in phase1, phase2 or phase 3.

Your new virtual identity is:

Username: Surrogate155

Email: Surrogate155@action-science2.org

Password: Vomu0681@

Click [here](#) to proceed to the first questionnaire 1 (3-5 minutes of your time required to finish) out of two questionnaires in total.

If you have **any question**, have trouble with your username/password, please **email** olaf.cames@online.liverpool.ac.uk or in case you need immediate assistance call this phone number [+1 407 745 1509](tel:+14077451509) (Skype phone - only local charges only will apply).

Thank you for reading this.

Olaf Cames

DBA researcher

Prof. Peter Smith

DBA supervisor

4.10.2 Experiment participants part 2 instructions

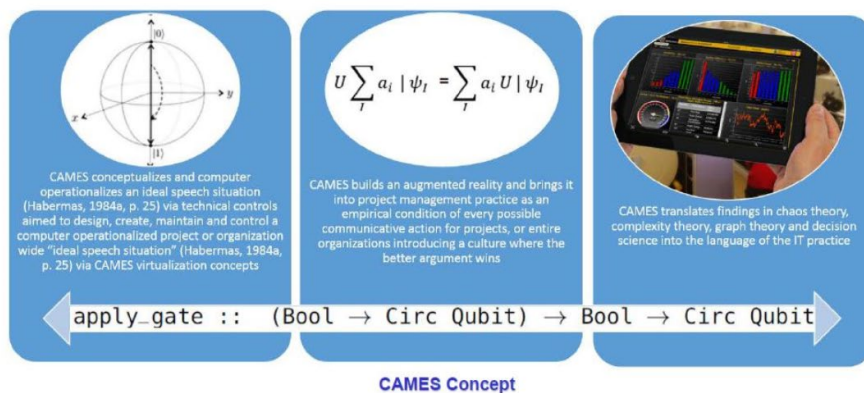
For Part 2 of the experiment participants received the following instructions where every participant had the opportunity to ask questions at or before the start of the survey monkey session:

You are being invited to participate in a research study.

The purpose of this study is the development of an early warning and intervention system aimed to lower the rate of failing projects where failure is not attributed to technical failures and to investigate why projects fail.

The study has been designed to help in the development of an experimental system for supporting project management and addressing the issues mentioned above. The system is named Corporate Action Methodology for Enterprise Systems (CAMES).

Corporate Action Methodology for Enterprise Systems (CAMES)



Applied Quantum Information Sciences

Should you agree to participate, you and your organisation will benefit from exposure to the latest developments in project management technology. The CAMES research system introduces new change and crisis management tools which easily integrate with conventional IT systems. As a participant, you will be helping to develop new methods of project management, from which we may all benefit in the future.

If you work in the project management field and your employees, customers and clients use IT in their daily work, your participation would be of use to this study. Your experience of taking part in project management will help the development of the CAMES system.

Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the attached Participant Information Sheet carefully and feel free to ask me (olaf.cames@online.liverpool.ac.uk) if you would like more information or if there is anything that you do not understand.

If you are willing to take part please sign (electronic signature is fine) the attached consent form and return it to me at olaf.cames@online.liverpool.ac.uk

I would like to stress that you do not have to accept this invitation and should only agree to take part if you want to. If you are willing to take part please proceed:

Experiment requires 2 steps and only 5-10 minutes of your time

*Step 1: Please E-sign the Consent Form: <https://rightsignature.com/forms/ConsentForm-esign-ec9528/token/18b90c7072b>
(or sign and email the attached consent form)*

Step 2: [Start your Questionnaire](#) (will take 5-10 Minutes to complete)

Thank you for reading this.

PS: For those participants who already participated in Part 1 of the experiment: Prof. Peter Smith had an accident and did not recover from his severe injuries. Professor Hefin Rowlands has taken of Peter's responsibilities.

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4.11 Summary

The inquiry focus of the two distinct experiments is the plausibility testing of the proposed course of action and the process by actually taking action.

Identical bias-free subjective data collection procedures applied two actions across two different situation and organisational relations. Both actions produced credible evidence and verification procedures. Practice can adapt the experiments by repeating both procedures, the plausible evidence action and the evidence verification action.

Action research received valid, plausible data that laboratory and thought experiments in decision science and quantum decision science transform methodically from academic literature and clinical experimentation into action research and that researcher bias and research instrumentation bias plausible evidenced as controllable, reduceable or avoidable.

The empirical study focused on project managers, due to the project-focused environment in the company from which data collected. Thus, the experiments replaced “facial stimuli” (Townsend et al., 2000; Busemeyer, Wang and Lambert-Mogiliansky, 2009) with project communication stimuli (Dahm, 2004). Experiment participants received narrative stereotype perceptions of typical and critical project member profiles per the selection criteria for participants requiring acting as project manager. Thus, fostering build-up of associated binary vectors according to the frame of references of acting project managers, permitting Hilbert space representation of first perceptual relations, the subject of review during data analysis in chapter results.

Chapter 5: Results

5.1 Introduction

The data collected during the experimentation phase produces comparable qualitative and quantitative inquiries. The credible evidence created and data collection verification procedures utilised during experimentation subject to this thesis new approaches to present and represent bias-free subjective data analytics.

The empirical data condense to measures of observed decision interference and abstract to the mathematical framework of the theory of quantum mechanics and the conceptual framework of the theory of communicative action.

Data convert into models of two- and many-valued logic establishing magnitude measures for a shared variable of cognitive reasoning predicting future behaviour with quantum mechanical certainty. Data displays compress individual and group information into assembly for intentions to act (Johnson and Onwuegbuzie, 2004; Guastello 1995, 2007).

Practice can reuse this thesis bias-free data analytics for identification and ranking of individuals and groups made up of such individuals for ranking according to the practitioner choice of the shared variable of examination. Data displays provide an immediate understanding advising practitioner to either decide on a course of action or to continue with additional data collection and data analytics (Miles, Huberman and Saldana, 2013).

5.1.1 Measuring observed decision interference on subjective group data

Human beliefs, attitudes, intentions, and behaviour entangle with judgements and decision making. The human decision maker is assumed to be in a state of superposition (Yukalov and Sornette, 2011; Ashtiani and Azgomi, 2016; Busemeyer, Wang and Lambert-Mogiliansky, 2009; Aerts, Sozzo and Tapia, 2012). Experiment question one, two and three reflect the probability of choosing. This probability lies between 0 and 1. The consistency of firm decisions across questions one (judgement 1), two (judgement 2) and three (judgement 3) would indicate a collapse of the superposition state, loss of superposition process dynamics and a high degree of biasing interaction with measuring process and measuring instrumentation (Bruza et al., 2009; Busemeyer and Bruza, 2012). High variance in decision making across judgements one, two and three would indicate the superposition state

dynamic maintains and no or insignificant biasing interaction by researcher or research instrumentation on the observed (Wang et al., 2018a; 2018b).

Superposition is a concept (Filk and Römer, 2011). Conflict is a concept. Conflicts are subject to dynamics (Aerts et al., 2016). Superposition is a concept of dynamics (Yukalov and Sornette, 2011). The variance between static and dynamics are interferences (Beim Graben and Blutner, 2016). Interferences transmute static into dynamic (Anderson, 1999). The absence of interference is the detection of static (Wang et al., 2018a).

Interferences can be measured. Difference between interference measures binds in two dimensions. Increasing and decreasing values of measured interferences bind to 2 dimensions (Bussemeyer and Bruza, 2012). Increasing and decreasing values of measured interferences represent as vectors in n-dimensional Hilbert space (Aerts, Broekaer and Smets, 1999). The concept of superposition represents 4-dimensional dynamics (Aerts, 2009).

The first dimension is the judgement of pros and cons. The second dimension is the time dimension. The second dimension establishes a boundary condition (Cramer, 2001). The experiment forced participants into three judgement situations for the same decision making context. Those three judgements separate in time in pre-judgements, vivid judgements, and post judgements (Bazerman and Moore, 2008). Both measures, the measure of pros and cons and the measure of time, express superposition (Van Fraassen, 2016).

Decision making is an inner conflict during judging on how to act and behave. The decision maker is in a cognitive state of superposition. The null hypothesis is that interaction from researcher and interaction of research instrumentation leads to bias and bias leads to the collapse of the dynamics of this cognitive state. The collapse would manifest to the state of the decision making at the time of the collapse. The conflict would vanish. The disappearance of decision makers judging conflict will lead to the disappearance of superposition. Asking the decision maker repeatedly for the same judgement would result in keeping decision makers decision consistent with the cognitive state at the time of superposition collapse. Decision maker answers would be consistent (Wang et al., 2018; Wang et al., 2018b).

The result of this action research field study is against the assumption of the null hypothesis that interaction of researcher and interaction of research instrumentation let to collapse of the dynamics of this cognitive state. The null hypothesis rejects.

The result of this action research field study is that after participants made their initial judgement in question 1, their cognition superposed in judgement 2 and judgement 3. Across time separated decision makings asking for the same judgement again, the participant's cognition changed, and the answers were inconsistent. Decision maker changed judgement 1 in judgement 2. Decision maker changed judgement 1 in judgement 3.

Given the results, the researcher concludes that this thesis new action science methodology is working and researcher bias and research instrumentation bias on observation significantly reduced or eliminated. Action research can practically utilise the conceptual framework of quantum mechanics in action research field studies.

To summarise, the researcher considers this thesis new action science methodology as suitable to bias-free collect subjective data in project field studies to establish mental concepts and analyses human behaviour in the researcher's particular work context.

5.1.1.1 Measuring "change" in judgement 2 (question 2)

Definition of "change" in judgement 2 (question 2):

Change identifies if a "good" response in question 1 follows a "defensive" response in question 2. Change identifies if a "bad" response in question 1 follows a "friendly" response in question 2.

Definition of "no change" in judgement 2 (question 2):

No change identifies if a "good" response in question 1 follows a "friendly" response in question 2. No change identifies if a "bad" response in question 1 follows a "defensive" response in question 2.

5.1.1.2 Detecting interference in judgements

Definition of "interference detection" in judgements

If change is high, then interference is high. If change is low, then interference is low.

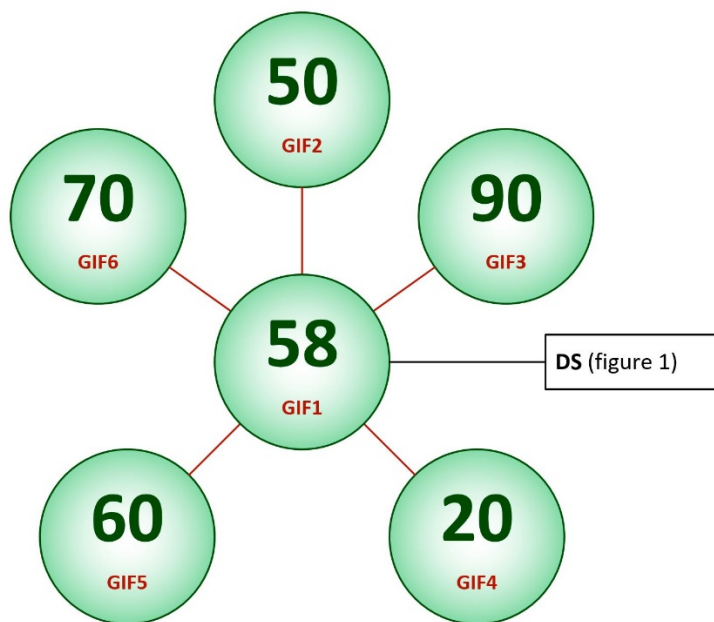


Figure 22 Variance in decision making between judgement 1 (question 1) and judgement 2 (question 2) per stereotype for the entire group (GIF 2-6) and as DS (figure 1) (GIF 1)

Variance 1 (GIF1): 58%

Variance 1 identifies as the average change in decision making between question 1 and question 2 across all five stereotypes across all participants (DS; figure 1).

Variance 2 (GIF2): 50%

Variance 2 identifies as the average change in decision making between question 1 and question 2 for stereotype 1 across all participants.

Variance 3 (GIF3): 90%

Variance 3 identifies as the average change in decision making between question 1 and question 2 for stereotype 2 across all participants.

Variance 4 (GIF4): 20%

Variance 4 identifies as the average change in decision making between question 1 and question 2 for stereotype 3 across all participants.

Variance 5 (GIF5): 60%

Variance 5 identifies as the average change in decision making between question 1 and question 2 for stereotype 4 across all participants.

Variance 6 (GIF6): 70%

Variance 6 identifies as the average change in decision making between question 1 and question 2 for stereotype 5 across all participants.

5.1.1.3 Measuring variance in judgement 3 (question 3)

Weighting expresses the degree of variance between decision making in judgement 1 (question 1) and decision making in judgement 3 (question 3). Weights are 0, 1, 3, 4, and 5. The smallest weight is 0, and 5 is the most substantial weight. A variance weighted as 0 represents no variance. A variance weighted as 5 represents the most substantial variance.



Figure 23 Definition of change in Question 3

Examples

“Good” response in question 1 followed by a “Definitely Yes” response in question 3 weights 0. “Good” response in question 1 followed by a “Probably Yes” response in question 3 weights 1. “Good” response in question 1 followed by a “Not sure” response in question 3 weights 3. “Good” response in question 1 followed by a “Probably No” response in question 3 weights 4. “Good” response in question 1 followed by a “Definitely No” response in question 3 weights 5.

“Bad” response in question 1 followed by a “Definitely No” response in question 3 weights 0.

“Bad” response in question 1 followed by a “Probably No” response in question 3 weights 1.

“Bad” response in question 1 followed by a “Not sure” response in question 3 is weights 3.

“Bad” response in question 1 followed by a “Probably Ye” response in question 3 is weights 4. “Bad” response in question 1 followed by a “Definitely Yes” response in question 3 is weights 5.

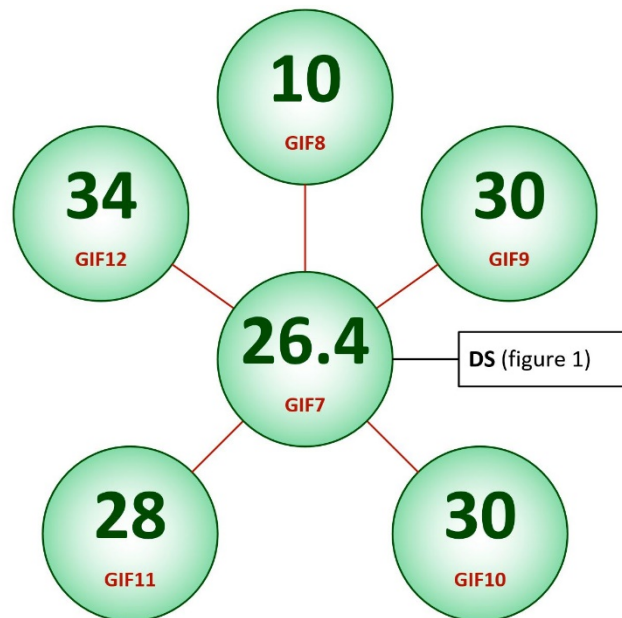


Figure 24 Variance in decision making between question 1 and question 3 per stereotype for the entire group (GIF 8-12) and as DS (figure 1) (GIF 7)

Variance 7 (GIF7): 26.4%

Variance 7 is the average variance for all five stereotypes across all participants (DS; figure 1). Considered is whether all participants’ decisions meet the variance condition in question 3.

Variance 8 (GIF8): 10%

Variance 8 is the average variance for all decisions concerning surrogate 1 meeting the definition for change. Variance 8 considers responses from all participants.

Variance 9 (GIF9): 30%

Variance 9 is the average variance for all decisions concerning surrogate 2 meeting the definition for change. Variance 9 considers responses from all participants’.

Variance 10 (GIF10): 30%

Variance 10 is the average variance for all decisions concerning surrogate 3 meeting the definition for change. Variance 10 considers responses from all participants’.

Variance 11 (GIF11): 28%

Variance 11 is the average variance for all decisions concerning surrogate 4 meeting the definition for change. Variance 11 considers responses from all participants’.

Variance 12 (GIF12): 34%

Variance 12 is the average variance for all decisions concerning surrogate 5 meeting the definition for change. Variance 12 considers responses from all participants’.

quantum interference modeling on subjective group data	Judgement 2 GIF2, GIF3, GIF4, GIF5, GIF6	Judgement 3 GIF8, GIF9, GIF10, GIF11, GIF12
Mean	58	26.4
Variance	670	260.4444
Stand. Dev.	25.8844	9.4234
n	5	5
t	2.5651	
degrees of freedom	8	
critical value	2.306	

Table 1 Conventional, statistical significance test on subjective group data

Interference in and between judgement 2 and judgement 3 is statistically significant. Group judgements in judgement 2 and judgement 3 are significantly different at $p < 0.05$. The calculated $t = 2.5651$ exceeds the critical value 2.306.

5.1.2 Measuring observed decision interference on subjective individual data

Contingent decision making between alternatives is a value orientation. Spins in value settings set a preference. Preference is before the mechanisms that order behaviour and coordinate actions. Measuring preferences of individuals in the project and organisational context identifies determinants of human behaviour in action situation (Aerts et al., 2016).

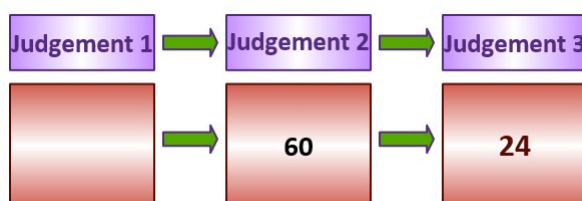
Experiment part 2 measures represent judging discrepancy per experiment participant per judgement. If variances are high, then context variables are of known truth, validity and utility. Experiment part 2 obtains a sequence of outcomes at the level of individuals.

Variables of type **vj2xxx**

The larger the variance for judgement 2, the more significant the discrepancy between judgement 1 and judgement 2.

Variables of type **vj3xxx**

The larger the variance for judgement 3, the more significant the discrepancy between judgement 1 and judgement 3.



IndividualVarianceJudgement2Surrogate5a (Ivj2S5a): 60%

The outcome is a value representing Surrogate5a's superposition process dynamics. If the value for Ivj2S5a measuring variance in decision making is high or significant, then is Surrogate5a still in a state of superposition. If Surrogate5a's state of superposition is high or

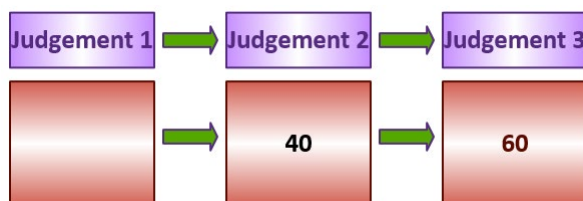
significant, then is Surrogate5a not in a state of wave collapse. If Surrogate5a's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S5a measuring variance in decision making is insignificant or low, then is Surrogate5a no longer in the state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate5a is subject to wave collapse.

IndividualVarianceJudgement3Surrogate5a (Ivj3S5a): 24%

The outcome is a value representing Surrogate5a's superposition process dynamics. If the value for Ivj3S5a measuring variance in decision making is high or significant, then is Surrogate5a6 still in a state of superposition. If Surrogate5a's state of superposition is high or significant, then is Surrogate5a not in a state of wave collapse. If Surrogate5a's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S5a measuring variance in decision making is insignificant or low, then is Surrogate5a no longer in the state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate5a is subject to wave collapse.



IndividualVarianceJudgement2Surrogate11 (Ivj2S11): 40%

The outcome is a value representing Surrogate11's superposition process dynamics. If the value for Ivj2S11 measuring variance in decision making is high or significant, then is Surrogate11 still in a state of superposition. If Surrogate11's state of superposition is high or significant, then is Surrogate11 not in a state of wave collapse. If Surrogate11's state of

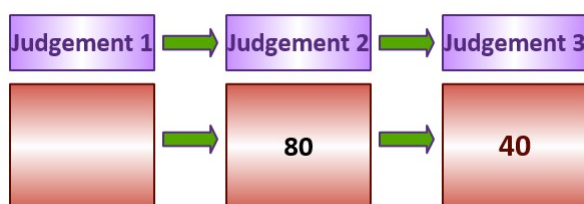
superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S11 measuring variance in decision making is insignificant or low, then is Surrogate11 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant and Surrogate11 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate11 (Ivj3S11): 60%

The outcome is a value representing Surrogate11's superposition process dynamics. If the value for Ivj3S11 measuring variance in decision making is high or significant, then is Surrogate11 still in a state of superposition. If Surrogate11's state of superposition is high or significant, then is Surrogate5a not in a state of wave collapse. If Surrogate11's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S11 measuring variance in decision making is insignificant or low, then is Surrogate11 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant and Surrogate11 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate455 (Ivj2S455): 80%

The outcome is a value representing Surrogate455's superposition process dynamics. If the value for Ivj2S455 measuring variance in decision making is high or significant, then is Surrogate455 still in a state of superposition. If Surrogate455's state of superposition is high or significant, then is Surrogate5a not in a state of wave collapse. If Surrogate5a's state of

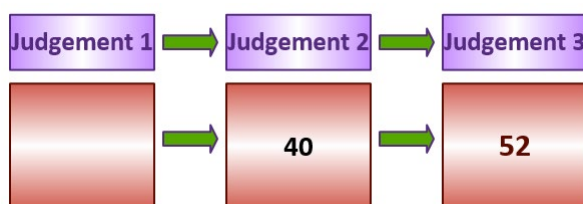
superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S455 measuring variance in decision making is insignificant or low, then is Surrogate455 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate455 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate455 (Ivj3S455): 40%

The outcome is a value representing Surrogate455's superposition process dynamics. If the value for Ivj3S455 measuring variance in decision making is high or significant, then is Surrogate455 still in a state of superposition. If Surrogate455's state of superposition is high or significant, then is Surrogate5a not in a state of wave collapse. If Surrogate5a's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S455 measuring variance in decision making is insignificant or low, then is Surrogate455 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate455 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate276 (Ivj2S276): 40%

The outcome is a value representing Surrogate276's superposition process dynamics. If the value for Ivj2S276 measuring variance in decision making is high or significant, then is Surrogate276 still in a state of superposition. If Surrogate276's state of superposition is high or significant, then is Surrogate276 not in a state of wave collapse. If Surrogate276's state of

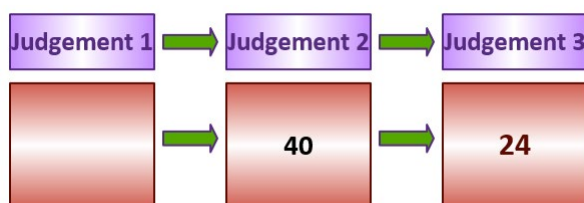
superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for $I_{vj2S276}$ measuring variance in decision making is insignificant or low, then is Surrogate276 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate276 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate276 ($I_{vj3S276}$): 52%

The outcome is a value representing Surrogate276's superposition process dynamics. If the value for $I_{vj3S276}$ measuring variance in decision making is high or significant, then is Surrogate276 still in a state of superposition. If Surrogate276's state of superposition is high or significant, then is Surrogate276 not in a state of wave collapse. If Surrogate276's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for $I_{vj3S276}$ measuring variance in decision making is insignificant or low, then is Surrogate276 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate276 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate448 ($I_{vj2S488}$): 40%

The outcome is a value representing Surrogate488's superposition process dynamics. If the value for $I_{vj2S488}$ measuring variance in decision making is high or significant, then is Surrogate488 still in a state of superposition. If Surrogate488's state of superposition is high or significant, then is Surrogate488 not in a state of wave collapse. If Surrogate488's state of

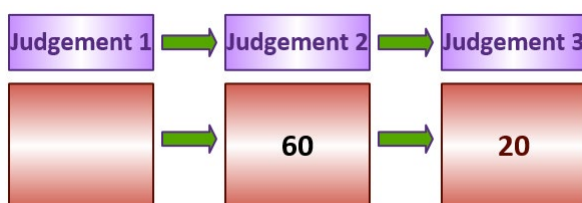
superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S488 measuring variance in decision making is insignificant or low, then is Surrogate488 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate488 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate448 (Ivj3S488): 24%

The outcome is a value representing Surrogate488's superposition process dynamics. If the value for Ivj3S488 measuring variance in decision making is high or significant, then is Surrogate488 still in a state of superposition. If Surrogate488's state of superposition is high or significant, then is Surrogate488 not in a state of wave collapse. If Surrogate488's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S488 measuring variance in decision making is insignificant or low, then is Surrogate488 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate488 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate355 (Ivj2S355): 60%

The outcome is a value representing Surrogate355's superposition process dynamics. If the value for Ivj2S355 measuring variance in decision making is high or significant, then is Surrogate355 still in a state of superposition. If Surrogate355's state of superposition is high or significant, then is Surrogate355 not in a state of wave collapse. If Surrogate355's state of

superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S488 measuring variance in decision making is insignificant or low, then is Surrogate355 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate355 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate355 (Ivj3S355): 20%

The outcome is a value representing Surrogate355's superposition process dynamics. If the value for Ivj3S355 measuring variance in decision making is high or significant, then is Surrogate355 still in a state of superposition. If Surrogate355's state of superposition is high or significant, then is Surrogate355 not in a state of wave collapse. If Surrogate355's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S355 measuring variance in decision making is insignificant or low, then is Surrogate355 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate355 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate154 (Ivj2S154): 60%

The outcome is a value representing Surrogate154's superposition process dynamics. If the value for Ivj2S154 measuring variance in decision making is high or significant, then is Surrogate154 still in a state of superposition. If Surrogate154's state of superposition is high or significant, then is Surrogate154 not in a state of wave collapse. If Surrogate355's

state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S154 measuring variance in decision making is insignificant or low, then is Surrogate154 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate154 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate154 (Ivj3S154): 20%

The outcome is a value representing Surrogate154's superposition process dynamics. If the value for Ivj3S154 measuring variance in decision making is high or significant, then is Surrogate154 still in a state of superposition. If Surrogate154's state of superposition is high or significant, then is Surrogate154 not in a state of wave collapse. If Surrogate154's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S154 measuring variance in decision making is insignificant or low, then is Surrogate154 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate154 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate121 (Ivj2S121): 60%

The outcome is a value representing Surrogate121's superposition process dynamics. If the value for Ivj2S121 measuring variance in decision making is high or significant, then is Surrogate121 still in a state of superposition. If Surrogate121's state of superposition is high or significant, then is Surrogate121 not in a state of wave collapse. If Surrogate121's state of

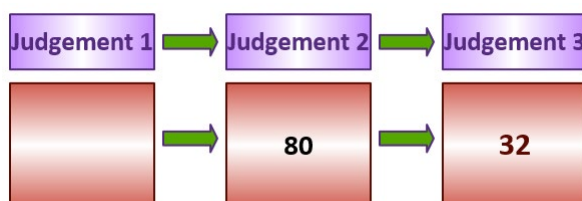
superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for $I_{vj2S121}$ measuring variance in decision making is insignificant or low, then is Surrogate121 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate121 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate121 ($I_{vj3S121}$): 48%

The outcome is a value representing Surrogate121's superposition process dynamics. If the value for $I_{vj3S121}$ measuring variance in decision making is high or significant, then is Surrogate121 still in a state of superposition. If Surrogate121's state of superposition is high or significant, then is Surrogate121 not in a state of wave collapse. If Surrogate121's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for $I_{vj3S121}$ measuring variance in decision making is insignificant or low, then is Surrogate121 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate121 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate44 (I_{vj2S44}): 80%

The outcome is a value representing Surrogate44's superposition process dynamics. If the value for I_{vj2S44} measuring variance in decision making is high or significant, then is Surrogate44 still in a state of superposition. If Surrogate44's state of superposition is high or significant, then is Surrogate44 not in a state of wave collapse. If Surrogate44's state of

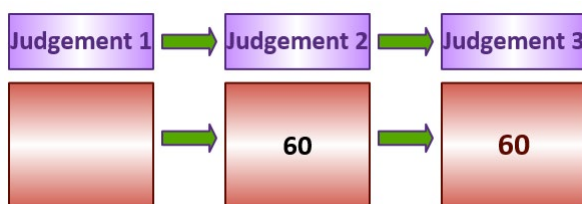
superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S44 measuring variance in decision making is insignificant or low, then is Surrogate44 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate44 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate44 (Ivj3S44): 32%

The outcome is a value representing Surrogate44's superposition process dynamics. If the value for Ivj3S44 measuring variance in decision making is high or significant, then is Surrogate44 still in a state of superposition. If Surrogate44's state of superposition is high or significant, then is Surrogate44 not in a state of wave collapse. If Surrogate44's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S44 measuring variance in decision making is insignificant or low, then is Surrogate44 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate44 is subject to wave collapse.



IndividualVarianceJudgement2Surrogate116 (Ivj2S116): 60%

The outcome is a value representing Surrogate116's superposition process dynamics. If the value for Ivj2S116 measuring variance in decision making is high or significant, then is Surrogate116 still in a state of superposition. If Surrogate116's state of superposition is high or significant, then is Surrogate166 not in a state of wave collapse. If Surrogate116's state of

superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj2S44 measuring variance in decision making is insignificant or low, then is Surrogate44 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate44 is subject to wave collapse.

IndividualVarianceJudgement3Surrogate116 (Ivj3S116): 60%

The outcome is a value representing Surrogate116's superposition process dynamics. If the value for Ivj3S116 measuring variance in decision making is high or significant, then is Surrogate116 still in a state of superposition. If Surrogate116's state of superposition is high or significant, then is Surrogate116 not in a state of wave collapse. If Surrogate116's state of superposition is high or significant, then is the interaction of measuring and interaction of researcher with the observed low or insignificant.

If the value for Ivj3S116 measuring variance in decision making is insignificant or low, then is Surrogate116 no longer in a state of superposition, the interaction of measuring apparatus or interaction of researcher with the observed is high or significant, and Surrogate116 is subject to wave collapse.

quantum interference modeling on subjective individual data	Judgement 2 lvj2S5a, lvj2S11, lvj2S455, lvj2S276, lvj2S488, lvj2S355, lvj2S154, lvj2S121, lvj2S44, lvj2S116	Judgement 3 lvj3S5a, lvj3S11, lvj3S455, lvj3S276, lvj3S488, lvj3S355, lvj3S154, lvj3S121, lvj3S44, lvj3S116
Mean	58	38
Variance	217.7778	260.4444
Stand. Dev.	14.7573	16.1383
n	10	10
t	2.8921	
degrees of freedom	18	
critical value	2.101	

Table 2 Conventional, statistical significance test on subjective individual data

Interference in and between judgement 2 and judgement 3 is statistically significant confirmed. Individual judgements in judgement 2 and judgement 3 are significantly different at $p < 0.05$. The calculated $t = 2.8921$ exceeds the critical value 2.101.

5.1.3 Measuring mental, collective, dynamic preferences on success factors

The experiment obtains a sequence of outcomes at the level of individuals. The questionnaire constructs a sequence of outcomes measuring a particular individual's preferences and intentions to act.

The first question establishes stereotypes. Perception of stereotype leads to categorisation preferences. Stereotype categorisation of project team members is a critical and typical instance in every project. The outcome is a particular individual's attitude to acceptance of a set of values the stereotype description represents. All five stereotypes represent different weights on creative, critical individuals. Categories bad and good establish unambiguous positioning.

The second question requires the participant to make a decision. The outcome is a decision to act. The outcome is a particular individual's attitude to acceptance of creative, critical individuals.

The third question requires additional action decision making. The outcome is a particular individual's attitude to acceptance of team diversity and acceptance of creative, critical team members.

Question one, two and three represent typical and critical project scenarios. Ability to create creative environments, foster diversity and maintain such by tolerance and sincerity are essential factors for project success or failure in researcher's particular organisational and work context. Creativity and diversity are critical ingredients for organisational competitiveness.

Groups or individuals are scoring high on measured preference towards creativity and diversity score high on initial sets of mental, collective, dynamic, and emergent success factors.

5.1.3.1 Context variables

Context variable 1 (CV1):

If the participant categorises stereotype 1 (labelled surrogate 1) as “good”	then the CV1 is 5.
If the participant categorises stereotype 2 (labelled surrogate 2) as “good”	then the CV1 is 4.
If the participant categorises stereotype 3 (labelled surrogate 3) as “good”	then the CV1 is 3.
If the participant categorises stereotype 4 (labelled surrogate 4) as “good”	then the CV1 is 2.
If the participant categorises stereotype 5 (labelled surrogate 5) as “good”	then the CV1 is 1.
If the participant categorises any stereotype (labelled surrogate) as “bad”	then the CV1 is 0.

Context variable 2 (CV2):

If the stereotype 1 (labelled surrogate 1) is acted on “friendly” by the participant	then the CV2 is 5.
If the stereotype 2 (labelled surrogate 2) is acted on “friendly” by the participant	then the CV2 is 4.
If the stereotype 3 (labelled surrogate 3) is acted on “friendly” by the participant	then the CV2 is 3.
If the stereotype 4 (labelled surrogate 4) is acted on “friendly” by the participant	then the CV2 is 2.
If the stereotype 5 (labelled surrogate 5) is acted on “friendly” by the participant	then the CV2 is 1.
If any stereotype (labelled surrogate) is acted on “defensive” by the participant	then the CV2 is 0.

Context variable 3 (CV3):

If the decision making of the participant results in “Definitely Yes”	then CV3 is 5.
If the decision making of the participant results in “Probably Yes”	then CV3 is 4.
If the decision making of the participant results in “Not sure”	then CV3 is 3.
If the decision making of the participant results in “Probably No”	then CV3 is 2.
If the decision making of the participant results in “Definitely No”	then CV3 is 1.

CV1Surrogate5a: 87%

The outcome is valued representing Surrogate5a’s mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate5a’s qualification for leadership positions.

CV1Surrogate11: 73%

The outcome is valued representing Surrogate11’s mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate11’s qualification for leadership positions.

CV1Surrogate455: 53%

The outcome is valued representing Surrogate455’s mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate455’s qualification for leadership positions.

CV1Surrogate276: 53%

The outcome is valued representing Surrogate276's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate276's qualification for leadership positions.

CV1Surrogate448: 60%

The outcome is valued representing Surrogate448's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate448's qualification for leadership positions.

CV1Surrogate355: 27%

The outcome is valued representing Surrogate355's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate355's qualification for leadership positions.

CV1Surrogate154: 60%

The outcome is valued representing Surrogate154's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate154's qualification for leadership positions.

CV1Surrogate121: 40%

The outcome is valued representing Surrogate121's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate121's qualification for leadership positions.

CV1Surrogate44: 33%

The outcome is valued representing Surrogate5a's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate5a's qualification for leadership positions.

CV1Surrogate116: 33%

The outcome is valued representing Surrogate116's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate116's qualification for leadership positions.

CV2Surrogate5a: 60%

The outcome is valued representing Surrogate5a's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate5a's qualification for leadership positions.

CV2Surrogate11: 73%

The outcome is valued representing Surrogate11's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate11's qualification for leadership positions.

CV2Surrogate455: 60%

The outcome is valued representing Surrogate455's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate455's qualification for leadership positions.

CV2Surrogate276: 47%

The outcome is valued representing Surrogate276's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate276's qualification for leadership positions.

CV2Surrogate448: 80%

The outcome is valued representing Surrogate448's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate448's qualification for leadership positions.

CV2Surrogate355: 60%

The outcome is valued representing Surrogate355's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate355's qualification for leadership positions.

CV2Surrogate154: 47%

The outcome is valued representing Surrogate154's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate154's qualification for leadership positions.

CV2Surrogate121: 40%

The outcome is valued representing Surrogate121's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate121's qualification for leadership positions.

CV2Surrogate44: 73%

The outcome is valued representing Surrogate5a's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate5a's qualification for leadership positions.

CV2Surrogate116: 40%

The outcome is valued representing Surrogate116's mindset for acceptance of creative, critical individuals. As higher the value as more Surrogate116's qualification for leadership positions.

CV3Surrogate5a: 42%

The outcome is valued representing Surrogate5a's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate5a's qualification for leadership positions.

CV3Surrogate11: 36%

The outcome is valued representing Surrogate11's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate11's qualification for leadership positions.

CV3Surrogate455: 35%

The outcome is valued representing Surrogate455's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate455's qualification for leadership positions.

CV3Surrogate276: 34%

The outcome is valued representing Surrogate276's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate276's qualification for leadership positions.

CV3Surrogate448: 36%

The outcome is valued representing Surrogate448's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate448's qualification for leadership positions.

CV3Surrogate355: 28%

The outcome is valued representing Surrogate355's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate355's qualification for leadership positions.

CV3Surrogate154: 33%

The outcome is valued representing Surrogate154's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate154's qualification for leadership positions.

CV3Surrogate121: 28%

The outcome is valued representing Surrogate121's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate121's qualification for leadership positions.

CV3Surrogate44: 30%

The outcome is valued representing Surrogate44's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate44's qualification for leadership positions.

CV3Surrogate116: 29%

The outcome is valued representing Surrogate116's mindset to establish team diversity and to foster and maintain such team diversity through tolerance and sincerity. As higher the value as more Surrogate116's qualification for leadership positions.

5.2 Conclusion

5.2.1 Direct measures of project relevant success factors

Participant Creativity & Diversity assessment			Data Quality / Validity			
PartID	Skill Score	Hiring Rank	Eigenvalue	Freedom from research bias	Statistical	significant
Surrogate5a@action-science2.org	158	2	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate11@action-science2.org	157	3	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate455@action-science2.org	142	5	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate276@action-science2.org	126	6	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate448@action-science2.org	164	1	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate355@action-science2.org	125	7	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate154@action-science2.org	124	8	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate121@action-science2.org	105	10	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate44@action-science2.org	143	4	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Surrogate116@action-science2.org	108	9	Y	Y	Y	t > cv, a=0.05 d.o.f=18

Figure 25 Experiment part 2 skill scores - Validity measures for claimed findings

Individuals showing low skill scores disqualify for project management roles. Individuals are showing high skill scores qualify for project management roles.

Low skill scores indicate increased risks that top-people leave, creative moments missed, organisational competitiveness lost and innovation factor goes down.

Column “Hiring Rank” (figure 25) provides ranked recommendation for the project sponsor which individual is best qualified to create, maintain and foster a project environment where top-people stay, creative moments occur, organisational competitiveness increases and the innovation factor goes up.

5.2.2 Measures related to project relevant success factors

Quantum entities are subject to influences by the act of measurement. Procedures developed in “meta-cycle of inquiry” (Coghlan and Brannick, 2012) methodology and applied

in “meta-cycle of inquiry” (Coghlan and Brannick, 2012) experiment part 2 measured influences from researcher or measuring device on the observed, in this case, a social group and individuals. The model build is a quantum mechanical model that subjects’ cognitive interaction between the observer and the observed, interviewer and interviewee, to quantum mechanical nature.

The Habermasian “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) measures if the participant exposes quantum behaviour. Quantum behaviour positively detects if the participants are in superposition for their action decision.

Experiment part 2 represents the action and the process of the action proofing if the quantum behaviour exposes. Only if the quantum behaviour is measured as present are eigenvalues calculated for the participant. The conditional proof that fully quantum behaviour exposed before eigenvalues calculate establish the certainty of claimed findings required to justify intervention initiatives.

The influence of the act of observation has been found to be non-contextual means the cognitive entity social group or individual proofed uninfluenced by an act of observation or measurement.

States that are not direct measures of the hypothesised research questions are measures related to such specific measurements. Measurement of states only related to direct measures of the hypothesised research questions label ‘superposition states’ in the quantum formalism. When the measurement of a cognitive entity identifies a superposition state, then is full quantum behaviour identified. Using the formalism of quantum mechanics, after detection that an action research field study exposes full quantum behaviour is therefore appropriate.

Once the research question hypothesised in truth or false states are resulting values predictable as long as the observed exposes full quantum behaviour. If the truth values of fully exposed quantum behaviour are low, then are hypothesis truth values unpredictable (Aerts, Broekaer and Smets, 1999).

Column “Freedom of research bias” (figure 25) indicates if at the time of participants’ response superposition was positively detected.

If “Freedom of research bias” (figure 25) is confirming full quantum behaviour at the time of participants’ judgement, then is participants’ response mathematically processed according to the mathematical formalism of the conceptual framework of the theory of quantum mechanics.

Column “Eigenvalue” (figure 25) indicates that the known capacity of the theory of quantum mechanics to predict with certainty applies to the answers of the participant that entered as a shared variable the mathematical formalism of the theory of quantum mechanics. The answer of the participant transformed into eigenvalue.

Participant responses marked positive in column ‘Eigenvalue” (figure 25) and positive in the column “Freedom of research bias” are certain and count as proven in their prediction of human behaviour.

Certain is that if the participant is in a comparable situation, his predicted behaviour is certain to occur.

Certain is that researcher’s measures can be repeated by others and the outcome of their measures is certain to predict the same.

This certainty is what the researcher’s current working situation requires.

This “meta-cycle of inquiry” (Coghlan and Brannick, 2012) results conclude that the process developed in “meta-cycle of inquiry” (Coghlan and Brannick, 2012) methodology will work with other variables carrying subjective data collected in action research field studies. The outcome of such measures will carry what the action researcher’s current, working situation requires to new and other different inquiries and new and other location and different organisational relations. This experiment plausibly evidenced that this thesis new action science methodology is relevant to the researcher’s IT project work context. The portability and variability of the process evidenced relevance beyond the researcher’s current work context.

Participant Creativity & Diversity assessment			Data Quality / Validity			
Stereotype	Group Preference	Skill Score	Eigenvalue	Freedom from research bias	Statistical	significant
Creativity/Criticality 5	2	176	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Creativity/Criticality 4	3	162	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Creativity/Criticality 3	5	122	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Creativity/Criticality 2	4	135	Y	Y	Y	t > cv, a=0.05 d.o.f=18
Creativity/Criticality 1	1	193	Y	Y	Y	t > cv, a=0.05 d.o.f=18

Figure 26 Group scorecard

The experiment evidenced that this thesis new action science methodology bias-free collects subjective data in project field studies to establish mental concepts and analysis of prevailing group behaviour (figure 26).

Project teams showing low skill scores disqualify for critical projects. Low skill scores indicate increased risks that top-people leave, creative moments are missed, organisational competitiveness lost and the innovation factor goes down. Those factors indicate early warning signs of an organisational build-up of circles of mediocrity (Masuch, 1985).

5.2.3 Predicting future behaviour with certainty

The experiment results in evidence that this thesis new action science methodology bias-free predict future behaviour of project members and project teams with certainty. Certain is that the likelihood that individuals behave in the future as predicted by this thesis new action science methodology is higher than the probability that the individual and group will suddenly change beliefs and preferences.

						D-D Alone PR(rejection) Sum	variance between PR(B) and PR(rejection)	D-D Alone PR(rejection) Definitely "No"	D-D Alone PR(rejection) Probably "No"	D-D Alone PR(rejection) Not sure
Stereotype	PR(G)	PR(D/G)	PR(D/B)	PR(B)						
1	1	90	70	10	10	20.00	10.00	10	0	10
4	2	10	0	0	90	90.00	0.00	10	50	30
3	3	60	10	30	40	50.00	10.00	0	20	30
4	4	20	0	0	80	90.00	10.00	10	50	30
2	5	70	50	30	30	20.00	-10.00	0	0	20

Figure 27 Inner dynamic

Experiment part 2 quantified measured group preferences (figure 14). The proportion of 'defensive' actions in the third judgement, the decision to decision (D-D) alone condition, is four times deviating from judgement 1. The quantised turn corresponds to turns in "truth" or "falsehood" (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) for the hypothesised research question according to participants' inner dynamics (figure 27) (Khrennikov, 2010b).

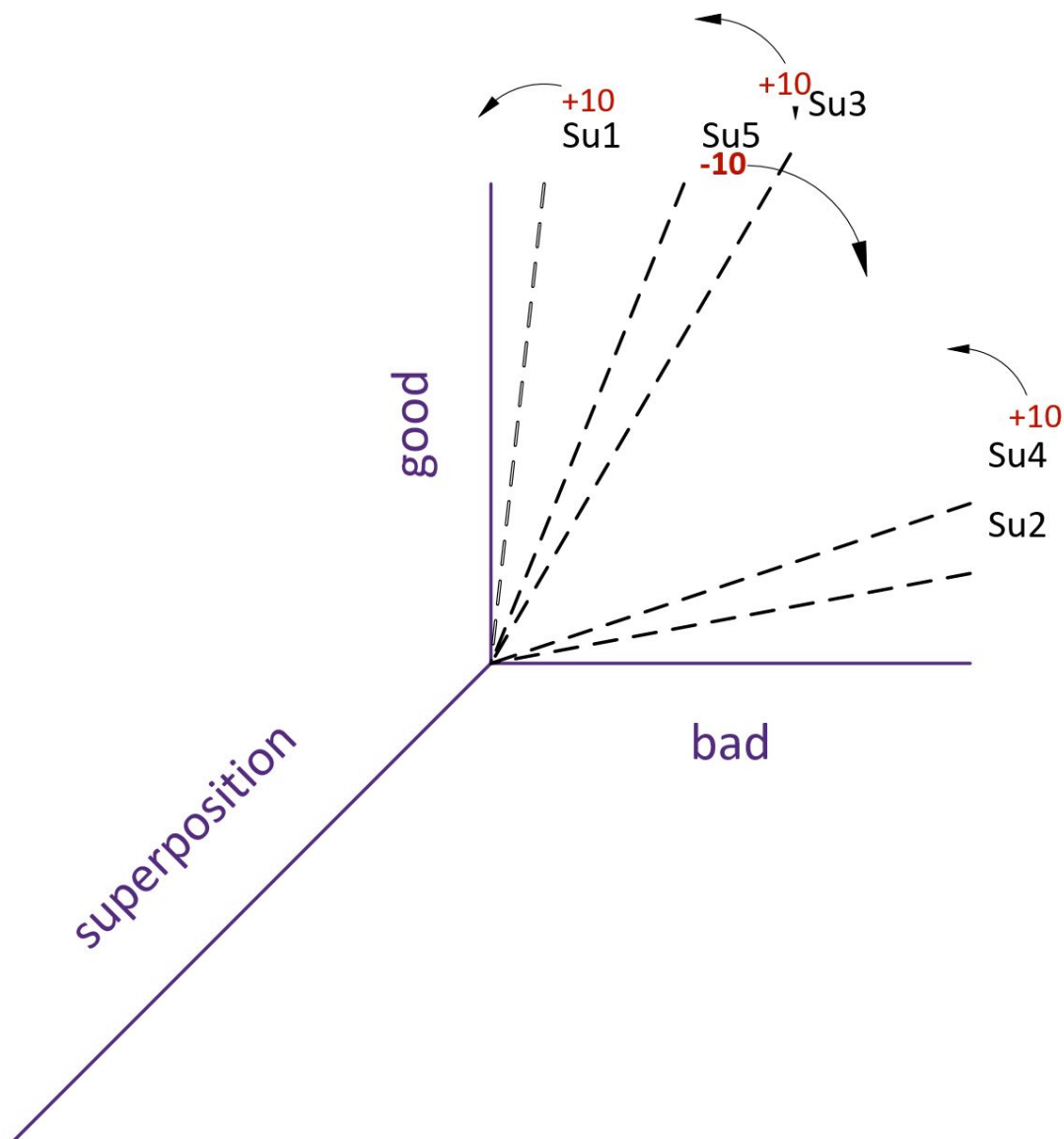


Figure 28 Eigenvalue for judgement 2 and spin in the behavioural forecast

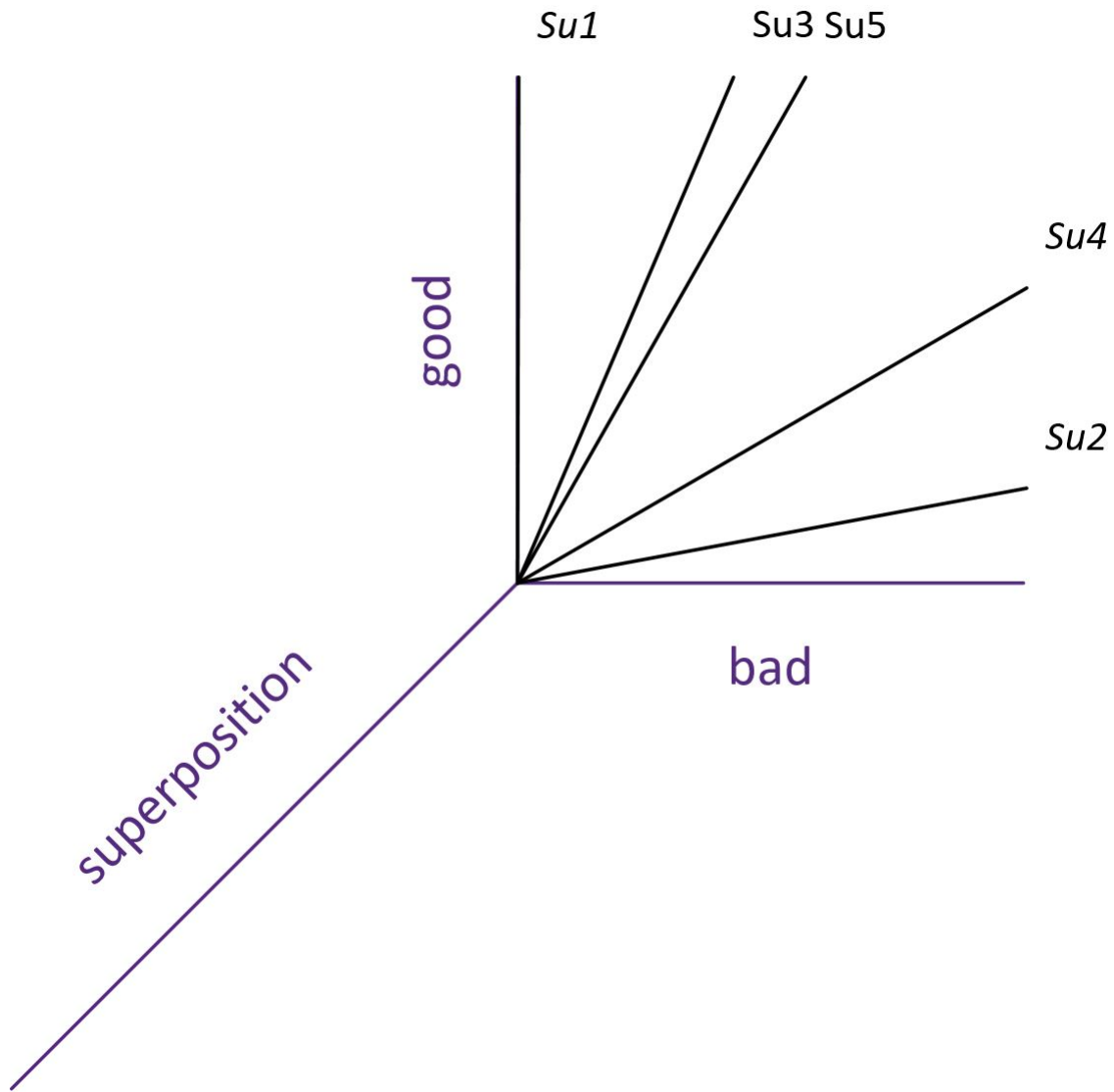


Figure 29 Eigenvalue for judgement 3

The hypothesised research question for group acceptance of surrogate 1, 3 and 4 spins towards acceptance and surrogate 5 towards rejection (figure 27; figure 28; figure 29). In connection with positives in the column, ‘Eigenvalue’ and positives in column “Freedom of research bias” (figure 25; figure 26) are spin determination certain and count as proven in their prediction of group behaviour.

The result is an intention to act. The calculation is an eigenvalue, and the outcome is certain. This thesis new action science methodology applies quantum mathematical two-factor Hamiltonian eigenvalue determination, as outlined in “meta-cycle of inquiry” (Coghlan and Brannick, 2012) methodology. Good/Bad and Defensive/Friendly create the unitary transformation of the participant's responses resulting in the entanglement of beliefs and

preferences over time (Van Fraassen, 2016). Experiment part 2 time is the time that passes between judgement 1, judgement 2 and judgement 3. Action probability calculates by using this transformation as interference. Interference establishes full quantum behaviour (Aerts, Broekaert and Smets, 1999). The interference depends on the value of the shared variable. The shared variable is the parameter in the Hamiltonian of the quantum model, and the value of the shared variable is the participant's judgement.

In case the participant responses in judgement 3 result in a cognitive state equal to judgement 1 the interference parameter is set to zero as depicted for stereotype 2 (figure 27; figure 28; figure 29). In case the unitary transformation representing participant's inner dynamic between belief, preferences and intention to act and behave is positive, it rotates beliefs in a manner that makes them consistent with preferences as depicted for stereotype 1, 3, and 4 (figure 27; figure 28; figure 29). In case the unitary transformation is negative, it rotates beliefs to be inconsistent with preferences as depicted for the surrogate 5 (figure 27; figure 28; figure 29) (Yukalov and Sornette, 2011). In sum predicts experiment part 2 group dominating intentions to accept creativity and diversity with certainty. This evidence is relevant to the researcher's particular organisational and work context (Bruza and Abramsky, 2017).

5.2.4 Measuring the intention to act

Judgement 3 repeated eigenvalue measurement of judgement 1. Judgement 3 reproduced the interference effects of the same observable from judgement 3 condition alone yield the same result (figure 12; figure 13; figure 14). Differences between judgement 3, judgement 2 and judgement 1 represent measures of the inner dynamics and empirically-testable probabilities (Busemeyer, Wang and Trueblood, 2012b).

5.3 Summary

This “meta-cycle of inquiry” (Coghlan and Brannick, 2012) results provide evidence that this thesis new action science methodology is relevant to the researcher’s particular organisational and work context.

The researcher concludes that “meta-cycle of inquiry” (Coghlan and Brannick, 2012) methodology translated into action in “meta-cycle of inquiry” (Coghlan and Brannick, 2012) experiment and proved practical in researcher’s current work situation.

The experiment tested this thesis methodology for bias-free collection of subjective data in a typical and critical work situation and established general principles of quantitative measurements of human behaviour in researcher’s particular work context.

This “meta-cycle of inquiry” (Coghlan and Brannick, 2012) results verified the practical utilisation of the conceptual framework of quantum mechanics in an action research field study.

5.3.1 Contribution to practice

Practice can use the outlined procedures as an interview tool and standardised evaluation tool for the performance-oriented observation in the organisational context. Direct measures of organisational relevant success factors identify individuals and groups showing low or high skill scores (figure 25). Group scorecards establish mental concepts and analyse prevailing group behaviour (figure 26). Quantum and conventional statistical data quality and validity measures test plausibility for claimed findings (figure 25, figure 26) and predict future behaviour of individuals and group made up of such individuals, with quantum mechanical certainty (figure 27). Practice is free to either execute unique or permanent identification and ranking of individuals and entire teams with plausible tendency to act hostile and contrary or with the intention to act compliant with the factors considered essential for organisational success. Thus, show those procedures value for practice as an interview tool or standardised evaluation tool for the performance-oriented observation of organisational performance.

Beyond the empirical plausibility testing on project managers due to the project-focused environment in the company from which data collected makes this thesis methodological contribution for bias-free communication, qualify for subsequent action research field studies and additional data collection. Thus, permit case studies with other, additional and new-shared variables. This thesis methodological contribution for practice is that the general principle to model in two- and many-valued logic establish ranking according to the practitioner choice of the shared variable of interest. This shared variable of interest establishes new, additional context between higher dimensional sense-making terms and lower dimensional quantum mechanical terms (Tarlacı and Pregnolato, 2016; Vaas, 2001a; Bruza, Widdows and Woods, 2006; Chadha et al., 2009; Cattaneo et al., 2009; Cignoli, d'Ottaviano and Mundici, 2013; Dubois and Toffano, 2016). Practitioner inherent the selection criteria independence from people, place, moment and instance and create case-ordered arrays for their choice of a shared variable by reusing the methods (figure 24; figure 25; figure 26). The result is data quality, data validity plausibility tested descriptive meta-matrix, ordered hierarchically according to the outcome of interest (Miles, Huberman and Saldana, 2013).

Chapter 6: Discussion

6.1 Introduction

This thesis is action research with multiple cycles of action and inquiries. The inquiry focuses on making a methodological contribution by developing a subject-bias-free method for communication in an organisational context. The terrain of the inquiry focus is the credible evidence that this methodological contribution is relevant for action research methodology. This action research inquiry demonstrates plausibility in three plausibility testing inquiries. Two plausibility demonstrations are subject of two distinct empirical studies. Both empirical studies focus on context project managers, due to the project-focused environment in the company and the project-focused LinkedIn Internet group from which data collect. Plausibility demonstrates by the acceptance of senior management for the proposed course of action and the acceptance by project managers in the alternate course of action independent of senior managerial approval. The third plausibility demonstrates by translating the methodological contribution into academic prescriptions into the particular context of quantum cognition science and quantum information science and the later adoption of thesis methodological contribution in four quantum cognition experiments by IBM.

In this sense of practical research design, qualitative reviews during the next round of “meta-cycle of inquiry” (Coghlan and Brannick, 2012) and the refinement of the methods developed by experimental verification in different inquiries, is the study an action research project (University of Liverpool, 2017; Herr and Anderson, 2014).

This chapter discussion extents theoretical discussion in academic literature to methodological recommendations for science and practice to utilise this study particular bias-free data collection and analysis methods as a predefined pattern to code similar analytical processes.

6.2 Contribution to knowledge

Organisational management false assumption that human behaviour is predictable by applying standard common sense and standard probability logic in conjunction with the lack

of action research bias-free subjective data collection and quantification methodologies lead to the motivation of this thesis (Jaafari, 2004; Williams, 2002). Human affinity to disregard standard probability logic requires to switch to another probability logic.

This other probability logic explains and forecasts human behaviour by interfering with standard probability logic. The existence of an interference pattern explains why humans do not follow standard probability logic. The application of interference pattern explains what probability logic human follow (Yukalov and Sornette, 2011).

6.3 Interference alternation

Interference phenomena have been the subject of scientific research for more than 100 years resulting in inventions of the uncertainty principle (Heisenberg, 1930; 2013; 1958; Born, Heisenberg and Jordan, 1926), bra-ket notation (Dirac, 1939), the spin theory (Pauli, 1940), wave collapse (Schrödinger, 1926), validity of uncertainty principle beyond quantum terminology (Bohr, 1928; 1958), the quantum of action (Planck, 1900), measurements accounting projective the measuring apparatus (Von Neumann, 1933), natural extension of three-dimensional space in multidimensional geometry (Hilbert, Von Neumann and Nordheim, 1928), and others. These 20th-century inventions accumulate to the invention of the theory of quantum mechanics (Busemeyer and Bruza, 2012).

At the beginning of the 21st-century social sciences observed that two naturally occurring phenomena arise simultaneously. Those two naturally occurring phenomena are the human behaviour phenomena and the interference phenomena in physics and mathematics (Vaas, 2001a; Khrennikov, 2006; de Barros and Suppes, 2009). The result is collective scientific evidence that human behaviour exposes interferences and for the effectiveness of quantum probability to explain and forecast human behaviour (Wang and Busemeyer, 2013; Yukalov and Sornette, 2011).

This context that mathematical formalism of quantum probability applies to behavioural problems in cognitive psychology is researcher's stimulus to apply quantum probability to human behaviour in researcher's organisational contexts.

6.4 The business process establishes context

Observation of communicative action establishes context. This thesis methodology combines the context of observing the communicative action in business processes with the literature reviewed parallelism of the two naturally occurring phenomena co-occurring. Those two naturally occurring phenomena are the human behaviour phenomena and the physical and mathematical interference phenomena. Speech acts and business processes reveal conflicts and communication breakdowns by observation (Cecez-Kecmanovic and Janson, 1999). Speech acts contextualise as a shared variable with mathematical formalism of quantum probability (Bruza and Abramsky, 2017).

Business process contextualised human behaviour reveal human intention to act and behave of in business processes (Chandon, Morwitz and Reinartz, 2005). The result is what the researcher's work situation requires. Researcher's work situation requires forecasting conflicts and communication breakdowns at a very early stage. Early stage indicators of undesirable behaviour in organisations introduce options for timely intervening and steering behaviour in the desired direction before becoming a threat to organisation success and organisational competitiveness (Caldwell, 2005).

This process of contextualisation behaviour in organisations via quantum probability experimentally evidenced. The invention of the 20th century, the theory of quantum mechanics, explains business process interferences by human behaviour more complete and delivers an individual's intention to act in organisational and economic context (Hettel, Flender and Barros, 2008; Feldman and Lynch, 1988). An intention to act is a forecast of an individual's future behaviour (Bisconti et al., 2014).

6.5 Collective scientific evidence for interference effects in human behaviour

The first published study of interference effects in human behaviour published 1997. This 1997 study obtained evidence that the mathematical-analytical procedures in the conceptual framework of quantum mechanics explains and predicts the critical and typical behavioural phenomena of lying, complete and with certainty (Aerts and Aerts, 1997).

The second evidence for the effectiveness in explaining and predicting human behaviour is the repeated success of applying the same principle of sharing variables between the two naturally occurring human behaviour phenomena and the physical and mathematical interference phenomena in other social contexts. The collective scientific evidence obtained in the first two decades of the 21st century for the effectiveness in explaining and predicting human behaviour includes explanation and prediction of behavioural paradoxes. Those paradoxes are substantial for organisational success, e.g. deficiencies in conceptual combination (Aerts, 2009), an individual's affinity to deceive by perception (Atmanspacher, Filk and Römer, 2004), biased judgments (Khrennikov, 1999), facts ignoring irrational decision making (Busemeyer and Bruza, 2012), intuitive decision making contrary to logic and calculus (Yukalov and Sornette, 2011; Busemeyer, Matthew and Wang, 2006; Franco, 2007; Khrennikov, 2008) in addition to an individual's affinity to ignore commonly agreed truth statements (Aerts, Broekaert and Smets, 1999).

The third scientific evidenced from collective efforts comparing the efficiency of classical, mainstream social sciences methodologies with the other new quantum interference pattern. Studies utilising classical Markov based social sciences methodologies and simultaneously utilising mathematical-analytical procedures based on the theory of quantum mechanics compared efficiency and certainty in explaining and forecasting of behaviour. Collective efforts evidenced that the theory of quantum mechanics provides a better, complete understanding and prediction of human behaviour than other theories. Traditional, mainstream methodologies for explaining and predicting of human behaviour based on the flawing theory of the law of total probability and methodologies based on this flawing law like Markov property based methodologies introduced additional interferences instead of measuring and explaining the observed interferences (Yukalov and Sornette, 2011; Busemeyer, Wang and Lambert-Mogiliansky, 2009; Aerts, 2009b).

Finally, science evidenced that human and instrumental bias is measurable and mathematically quarantinable. Measuring and mathematically isolating bias results in bias-free certainty for a claimed explanation. Specific, bias-free measures result in a certain prediction of human behaviour (Wang et al., 2018b). Precise prediction of human behaviour confirms the thesis hypotheses of RQ3 and RQ4.

This interpretation of the theory of quantum mechanics permits contextualisation of bias. The mathematical-analytical procedures that result in the measurement of biasing forces on the observed individual and by the research instrumentation are a.k.a. “quantum weak measurement” (Wang et al., 2018b). Weak force mathematical-analytical methodologies measure the effect of human interaction on the measuring process (Windridge and Nagarajan, 2017).

Those four collective pieces of evidence for completeness, bias elimination and certainty for claimed findings motivated this thesis research to revise conventional mainstream action research strategies. According to discussions in the academic literature reviewed not only prevent conventional, mainstream Markov probabilistic–dynamical systems complete interpretation and quantification of subjective data in field studies but rather introduce bias in (Engesser, Gabbay and Lehmann, 2009; Busemeyer, Wang and Lambert-Mogiliansky, 2009).

6.6 The empirical case for RQ1, RQ2, RQ3 and RQ4

6.6.1 General principles for bias-free research strategies and predicting human behaviour with certainty

Researcher's conclusion to apply the new, interdisciplinary unifying interference patterns in a new and different action research strategy with planned instrumentation proofed practical in researcher's typical and critical work situation. Initial measurement followed by planned interferences via a 2-state vector formalism, limiting the number of different states for research participants and confirmed RQ1, RQ3 and RQ4 as plausible (Aharonov and Vaidman, 2008; Wang and Busemeyer, 2013).

Measuring naturally occurring phenomena result in measures of naturally occurring interferences. Applying solutions for measuring context prone quantum observables to problems in context-dependent social interactions is plausible (de Barros, Coecke, and Pothos, 2017). Contextualising this general principle into research questions for human behaviour in an organisational situation proved practical. The researcher concludes from experiment results that a Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990), deployed as action research instrumentation, detect biasing interferences in action research field studies with certainty.

6.6.2 CAMES – an interpretative methodology for the organisational management practice

Researcher concludes from experiment results that interferences to the Habermasian categories of "truth" (Habermas, 1987a; Habermas, 1990; Habermas 2002) and "sincerity" (Habermas, 1987a; Habermas, 1990; Habermas, 2002) are quantum mechanical measurable as "truth" or "falsehood" (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012). Ontological terminologies of qualitative interpretative methodologies, e.g. the theory of communicative action, are measurable and quantitative expressible as one or more than one quantum mechanical state. This conglomerate of mixed methodologies deploys in CAMES as action research instrumentation via a Habermasian "ideal speech" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) construct. This deployment proofed practical in two typical work situations.

Deployment of Habermasian “ideal speech” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) constructs in two typical and critical IT practise work situations measured “truth” (Habermas, 1987a; Habermas, 1990; Habermas 2002) and “sincerity” (Habermas, 1987a; Habermas, 1990; Habermas, 2002) three times. Three times have qualitative and ontological terms been contextualised and posted to participants. Three times per experiment participant has the same research question been asked and measured quantitative and quantum mechanical. All measures, the first measure (judgement 1), the second measure (judgement 2) and the third measure (judgement 3) positively measured “truth”. Truth measured as quantum and conventional statistical significant interference (Holevo, 1973; Belavkin, 1975). The difference between the responses from participants in their first and their third behavioural measure quantifies the participant’s intention to act. This quantised turn corresponds to turns in “truth” or “falsehood” (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) for the hypothesised research question. The hypothesised research question correlates the quantised turn with participants’ inner dynamics and changing behaviour, a qualitative entity (Khrennikov, 2010). The resulting geometrical depiction in Euclidian space (figure 28; figure 29) visualises the mathematical predicted behavioural turn as angular momentum (Dubois and Toffano, 2016; Bruza et al., 2009).

Academic literature and experimental results reviewed, therefore, confirm RQ1 and RQ2 as probable based on experimental prove of practicality in researcher’s work situation.

6.6.3 Transform mathematical complexity into ontological simplicity

Existing and scientifically proven quantum-like (Khrennikov, 2010), quantum structure (Aerts, 2009; Bruza and Abramsky, 2017) and weak force (Atmanspacher, Römer and Wallach, 2002; Wang et al., 2018b) procedures for behavioural anomaly detection qualify for subjective data collection and quantification. Behavioural anomaly detection in action research field studies, in typical and critical organisation work situation, proved practical. Individuals and the group made up of those individuals score in measured preference towards behaviour considered contributing significantly as success factors for organisations. Measures of qualitative behavioural properties of organisation participants attribute as certain for claimed findings if the shared variable tests positive in exposing fully quantum behaviour (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012) states as the result of quantum mathematical-analytical procedures (Aerts, Broekaer and Smets, 1999).

The organisational management practice can, therefore, use quantum mathematical-analytical procedures to predict an individual's future behaviour with certainty in case both tests, the test for the qualitative observable behaviour and the test for fully exposed quantum behaviour, signal "truth" (Aerts, Broekaert and Smets, 1999; Busemeyer and Bruza, 2012). This certainty results in researcher and IT practitioner justification to intervene and steer behaviour in organisations and organisational context and request funding for strategic intervention initiatives.

6.6.4 Closing the gap between scientific progress and lack of domain knowledge in action research

Researcher's conclusion that ideas from existing and peer-reviewed mathematical-analytical procedures according to the theory of quantum mechanics transform into action and a methodology the organisational management practice requires proved practical and confirms the hypotheses of research questions RQ1, RQ2, RQ3 and RQ4. Transforming prediction failures into certainty for claimed findings closes the gap between theory and practice (Kieser and Leiner, 2009).

The organisational management practice and mainstream action science lack methodologies providing certainty for claims of behavioural deficiencies in projects. Organisational sciences, action science and action research academic literature published no complete research for a methodology of bias-free collection and no actionable prescriptions for bias-free quantification of subjective data in field studies (Williams, 2002). This lack of domain knowledge in action research retains the "wicked problem" (Stubbart, 1987, quoted in Pearson and Clair, 1998, p. 62) in its macro world chaotic appearances (Benbya and McKelvey, 2006).

This thesis methodology unites action science with sciences progress in analytical procedures measuring human behaviour via quantitative and qualitative research methodologies in social sciences (Haven and Khrennikov, 2013), finances (Khrennikov, 2010; Schaden, 2002), game theory (Piotrowski and Śładkowski, 2003), decision sciences (Busemeyer and Bruza, 2012; Busemeyer, Wang and Lambert-Mogiliansky, 2009), cognitive science (Trueblood and Busemeyer, 2011), psychology (Aerts and Aerts, 1997), marketing

(Choustova, 2007), genetics and economy (Accardi, Khrennikov and Ohya, 2008; Baaquie, 2007; Khrennikov, 2009).

6.6.5 Translating theoretical complexity into the particular action of the researcher's work context

Researcher's conclusion that anonymity and confidentiality established in typical and critical organisational management work situation of diverse locations proved practical and confirmed RQ2, RQ3, and RQ4 as plausible.

Theoretical complexity translates into one or more than one work context. CAMES research instrumentation locates a Habermasian "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) into a particular action. This particular action contextualises disruption of the societal status quo of an individual (Gioia and Chittipeddi, 1991). This thesis experiments contextualised action in two particular work contexts and proved twice the general applicability and practicality in researcher typical and critical workplace situations. The workplace situation proved experimentally that the mathematical framework of quantum mechanics verifies claimed disruption of the societal status quo of an individual in the organisational context.

The researcher took action and researched the process of taking the action of disrupting the societal status quo in two typical and critical IT project environments. One typical and critical work situation implemented Habermas axioms of an "ideal speech situation" (Habermas, 2002; Habermas, 1987a; Habermas, 1990) where a vice president in charge of global organisation management office recommended participation in this experiment to their more than 250 globally dispersed organisation managers. The researcher retook action and researched the process of taking the action of disrupting the societal status quo of individuals and verified claimed disruption of the societal status quo in another typical and critical researcher work situation where experienced organisation manager peer-cooperate in a LinkedIn virtual community with participants from 5 continents, without physical and managerial supervision.

These two empirical cases of experimental proof that this thesis research strategy with upfront instrumentation proved practically in more than one and different inquiries, in more

than one and different locations, and in more than one and different organisational relations establish plausibility for this thesis underlying ontological and theoretical assumptions.

This thesis underlying ontological and theoretical assumption is that Habermas axioms of an “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) and the theory of communicative action definitions of observable and non-observable pathological and distorted communicative action applies to evidence behavioural issues in researcher’s work situation.

That an “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) qualifies to evidence behavioural issues in a researcher’s work situation proves that this research instrumentation is not limited to IT projects. Instead, it proves that an “ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) universally deploys across different organisational relations, more than one work context and more than one locality. Universal applicability to collect and quantify subjective data in organisational context creates independence from organisational relations, work contexts and localities (Habermas, 2002). Independence from organisational relations, work contexts and localities matches researcher organisational management practice real-life situations where behaviour occurs predominantly in virtualised workplaces and in multiple organisations the researcher has to supervise at the same time. Context independence satisfies Habermasian requirements for execution of his “universal pragmatics” (Habermas, 2002) and establishes a building block between the theory of communicative action and the theory of quantum mechanics confirming the hypothesis of RQ2.

Disrupting societal status quo meets requirements of the theory of quantum mechanics as well. Quantitative measures require re-initialisation and reset to zero ensuring every research question verifies for exposure of fully quantum behaviour and bias-free quantification of subjective data before applying interference patterns (Sasaki and Carlini, 2002). Experimental results prove that a behaviour reset to zero occurred for every research question posted to every participant as a judgement in researcher typical and critical work situation tested. Prove of claimed fully quantum behaviour and bias-free quantification of subjective data, obtained by quantum and conventional statistical significance checks, establishes the certainty and justification researcher requires to intervene and steer

behaviour in the desired direction via practical knowledge generation (Greenwood and Levin, 2006; Holevo, 1973; Belavkin, 1975).

6.7 The non-empirical case for RQ1, RQ2, RQ3 and RQ4

6.7.1 The next action research step: contextual intervention for social change via practical knowledge generation

Evidenced more complete understanding of behaviour in organisations and empirical verification of adaptability and portability into multiplicities of organisational management practice workplaces lead to next step challenges and opportunities.

The research interest of this thesis is practical (Habermas, 1972). The practical approach is to generate information and guidance for the practitioner. This thesis interpretative methodology and the information generated by the experiments create a more complete understanding of behaviour in organisational context. Qualitative and quantitative textual analysis create practical knowledge through interpretation (Herr and Anderson, 2014).

6.7.2 Next step challenges

This thesis interpretative methodology approach requires the researcher's knowledge and action and consists primarily of manual processes and procedures. Next step challenges require meeting organisational management demands for control and steering methodologies. The research interest moves from interpretation and understanding to the technical research interest of control and steering (Habermas, 1973).

The organisational management practice management embeds in organisational efficiency requirements. Services and products of IT projects are rarely for themselves. Beneficiaries of IT project deliverables are predominantly other departments in the same organisation, or the beneficiaries are customers not belonging to the same enterprise. The efficiency obligation necessitates that these thesis manual interpretative procedures satisfy management desires for control over behavioural risk factors in organisational context beyond understanding behavioural risk factors in organisations (Williams, 2002).

Management interest in control over behaviour is a technical interest. Technical interests

are the logical next steps after an interpretative methodology provides knowledge and understanding (Herr and Anderson, 2014).

Behavioural steering initiatives on a more extensive scale than researcher's immediate workplaces and work situations require that the evidenced adaptability and portability of this interpretative methodology approach in organisational management practice transform into practical imperative controls (Weber, 2009).

Imperative controls are management controls for strategic human resource steering initiatives. Strategic management controls establish automatic steering capabilities (Jeffrey and Laurie, 1994). Acting in real-time, defined as "little or no lag time between occurrence and reporting" (Eisenhardt, 1989), if the behaviour in organisations indicate threats to organisational success is imperative to avoid organisational management misinformation. The next step challenge is that manual procedures in CAMES require transformation into automation.

Automation establishes strategic control (Jeffrey and Laurie, 1994). In the context of researcher's work situation needs the research interest move on from practical interests of understanding and interpreting behaviour into technical research interest to control the societal realm (Habermas, 1972). This next step technical research interest must automate both, the interpretative methods created in this thesis and the technical controls to act, intervene and steer behaviour in the desired direction (Dutton and Ashford, 1993). Technical controls establish what organisational management require. Organisational management require to understand behaviour with certainty in more than one typical, critical situation simultaneously, on an enterprise scale and across numerous organisations in real-time.

6.7.3 Next step opportunities

Automation of both, the practical understanding of behaviour and the real-time controlling of organisational, communicative action, intervention and steering of behaviour in multiple organisations in real-time provides the opportunity to foster creative and innovative potentials of individuals and increase the organisational competitiveness overall. Innovation

is an individual skill and mindset that enter into a process with transformational change potential (Meindl, 1990).

Fostering creative and innovative potentials of individuals is the next logical step after imperative controls permit intervention and steering of behaviour in the desired direction. Imperative controls must include assumption detection as well as steering readjustment processes and responses to decouple sense-making from escalation (Weick, 1988). The research interest switches from the control of the societal towards an emancipatory research interest to switch bias-prone managerial authoritarian control towards bias-free technological control (Edwards, 1981, cited in Barker, 1993).

This switch from authoritarian managerial control towards bias-free technological control aimed to transport individual innovation power into organisational competitiveness is a strategic management task. Automation of access and examination of the project and organisational member believes change not only current individual behaviour to the desired behaviour but to transform organisational belief structures and current organisational practices to desired practices (Hintikka, 1961, cited in Elster, 1983). The entangling of individual believes with organisational believe structures transform individual potentials into organisational competitiveness (Dechter, 2003). In the context of this thesis and the experiment is determined by experimental prove how individual potentialities or deficiencies measure with certainty and mathematical precision.

Transformation of this thesis manual mathematical-analytical procedures into automated mathematical-analytical technical controls alter current authoritarian dominated organisational management practices. The next step opportunity is to substitute inefficient managerial authoritarianism with a high degree of efficiency (Collins, 1997). This opportunity depends on if the challenge is met. The challenge is to carry out imperative control over human beings without human bias interferences (Weber, 2009, cited in Collins, 1997).

Both next steps, changing research interest towards transformative interpretative and towards control and emancipatory methodologies, ground on this thesis interpretative and manual prototyped technological virtuality (Nightingale, 1998; Kash and Rycroft, 2002)

6.7.4 Action research strategy with upfront planned instrumentation

The researcher's conclusion that the result of this thesis experiment obtained prove of adaptability of existing and scientifically proven quantum-like procedures for behavioural field studies in typical, critical organisational management practice work situation lead to opportunities for control of the behaviour in typical, critical work situations.

The researcher's conclusion that the result of this thesis experience obtained prove of practicality that this thesis methodology with upfront instrumentation located behavioural data collection and quantification into more than one inquiry, more than one action, and more than one organisational relation lead to opportunities for intervening and steering of the behaviour in researcher's typical, critical work situations.

Both conclusions particular confirm RQ2, RQ3, and RQ4 as plausible. Both lead to next step challenges and opportunities.

6.7.5 The non-empirical case for RQ1, RQ2, RQ3 and RQ4

Emerging new technologies introduce virtuality as an opportunity to use sense-making higher dimensional social theories and management science power laws into a many-worlds theory of parallel higher structures (Kaku and O'Keefe, 1994). The new, emerging technologies to automate this thesis interpretative methodology into imperative controls for strategic change are not commonly available, yet. Empirical cases contradicting this developing theory do not exist.

The empirical realm is, therefore, temporarily substituted by comprehensive views, a common practice in action research (Jones, 1986). This thesis creatively executes action research metatheoretical orientation by introducing comprehensive views. Creating theories about theories create action research metatheories, metalogic and multiple paradigms (Hassard, 1991). Both theory and logic check on empirical verification opportunities. Non-empirical, multiple paradigms and organisational analysis, therefore, predate the empirical case resulting in more than one empirical domain (Jones, 1986, cited in Morvan and O'Connor, 2017; Zhang and Dzhamalov, 2016).

A multiplicity of testing opportunities in different empirical domains establish conceptual generality. Conceptual generality and definition of empirical domains for verification of practicality are contingent on sufficient abstraction levels of action research metatheories (Morvan and O'Connor, 2017). Appendix B and C provide a preview of next steps paradigms and organisational analysis and potential empirical domains for testing.

6.8 Conclusions

Theoretical discussions in academic literature consider quantum-mathematical logic to measure an individual's preferences for behaviour, to detect an individual's changing behaviour, and to predict an individual's future behaviour. Academic reports and completed research transform the complexity of theoretical mathematical-analytical ideas into quantitative methodologies. Altogether, academic discussions and reports reviewed inform about a unifying research strategy defined as upfront instrumentation in either a laboratory or clinical study (Williams, 2002).

This thesis experiment translates ideas, analytical procedures and mathematical logic into the research strategy suggested for action research field studies. The resulting recommendations utilise aspects from ideas in social sciences (Haven and Khrennikov, 2013), decision sciences (Busemeyer and Bruza, 2012; Busemeyer, Wang and Lambert-Mogiliansky, 2009), cognitive science (Trueblood and Busemeyer, 2011), and psychology (Aerts and Aerts, 1997) for proof of practicality.

The researcher concludes by reviewing the results of two experiments that the hypotheses of research questions RQ1, RQ2, RQ3 and RQ4 confirm as empirical evidenced practical and verify the underlying theories and conceptions as plausible.

The likelihood that individuals behave in the future as predicted by this thesis new action science methodology is higher than the probability that the individual and group will suddenly change beliefs and preferences for behaviour.

7 Future research and limitations

7.1 Introduction

This thesis methodology roots in the context of virtual work situations and RQ1, RQ2, RQ3 and RQ4 postulated paradigms.

Next step challenges and opportunities serve technical and emancipatory research interests. New research interests crate new methodology (Habermas, 1972; Herr and Anderson, 2014). Next steps extension of this thesis interpretative and labour-intensive methodology involve automated management to control in real-time and strategic steer across the enterprise.

Technical research interest results in technical controls (Habermas, 1973). Automated controls in organisational management are computer operationalised controls. The organisational management requires that this thesis interpretative methodology transform from manual procedures into efficient, computer operationalised standard procedures. Standard computer operationalised procedures substitute the need for the knowledge and action of a researcher by establishing programmed knowledge techniques as best practice procedures (Eisenhardt and Martin, 2000; Pedler, 2010)

Experimental evidenced practicality proves RQ1, RQ2, RQ3 and RQ4 and the underlying theorems and axioms as plausible. This thesis scientific evidenced axiom that cognitive schemata can be mathematically proven justify extending this thesis interpretative methodology with additional scientific evidenced axioms that determine behaviour.

Another scientific evidenced axiom extending thesis interpretative methodology is that no empirical process can be applied to understand indeterministic, non-linear situations (Aerts and Aerts, 1997). Any understanding requires augmentation of empirical processes by theoretic and logical reasoning processes. The absence of empirical cases shall not be used to construct 'superficial description' arguments of behaviourists as the unseen and unmeasurable is considered practical in action research (Cooper, 2007). Action science and action research consider motivation and cognitive consistency as essential behavioural forces without the immediate need for empirical cases and the prerequisite of perceptual evidence (Festinger, 1962; Morvan and O'Connor, 2017).

An additional scientific evidenced axiom extending thesis interpretative methodology is that the macro presence of Heisenberg's uncertainty principle and applicability of mathematical measuring procedures according to the Copenhagen wave collapse interpretation discover concealed trajectories (Bohm, 2012). Researcher's interpretations of hidden, postulated behaviour transform into cognitive schematizing of hidden behavioural trajectories in a Euclidean sense (Habermas, 1973).

The guiding principle and underlying axiom researcher considers for meeting organisational management practice demands are therefore that behaviour is indeterministic and can never deterministically defined. Efficient certainty about human behaviour is entirely the outcome of measures of the likelihood that behaviour will occur.

The above axioms define limitations and future research.

7.1.1 Future research

This thesis methodology provides an understanding of behaviour in projects and organisational context through interpretation of subjective data collected in practice. These thesis analysis procedures provide quantification of behaviour resulting in an interpretation of behaviour. The research instrumentation proved reusable. This thesis methodology requires experienced action researcher handling processes and procedures and translating the ideas from theories and academic literature into organisational management practice action.

Future research is needed to extend this thesis' research interest, which is limited in scope to practical interests and interpretative methodology towards control and emancipatory research interests. Control and emancipatory research result into next step extensions.

Organisational management demands for control of the social situation in organisational context require the technical controls resulting from technical research interests.

Management demands for steering and intervening in social situations require knowing the belief structures of organisational members before influencing such. Future research subjects and results from emancipatory research interests to free organisational practices from coercive behaviour (Habermas, 1972).

This emancipatory research interest requires that this thesis methodology scale up from the typical and critical case to the real-time anywhere, everywhere on an enterprise scale.

Scaling up from the typical and critical case to the real-time anywhere, everywhere requires that this methodology research instrumentation meet organisational management practice efficiency requirements. Efficiency requirements demand that this thesis' non-technical, mathematical-analytical procedures translate into organisational practice computer-operationalised standard operational procedures.

7.1.2 Future research challenges

The organisational management practice and action research lack procedures to bias-free determine or predict project and organisational member behaviour with certainty even though science created collective evidence that such exists as this thesis plausible proved (Williams, 2002).

It is a management issue to move on from the assumption that measures and claims about behaviour in organisational context is inaccurate towards an understanding that science obtained collective evidence that behaviour is bias-free measurable and quantifiable (Uhl - Bien, Marion and McKelvey, 2007; Wang et al., 2018b). It is a management issue to collect and measure behavioural data and to determine with certainty if behavioural patterns detect considered unfavourable for a project or organisational success. It is a top management issue to control and steer behaviour in projects and across various organisational relations and locations.

It is an organisational sciences and management science issue to move on from metaphoric, abstract ideas and proclamations that there is no bias-free subjective data collection and quantification methodology for action research field studies towards closing this gap and build one.

In the light of this thesis findings and discussion in academic literature is the next step to contextualise the management issues and define behaviour considered contributing or threatening organisational success as a quantum mechanical shared variable.

Future research faces the challenges to translate this thesis' mathematical-analytical procedures into scale and automation for efficiency. Scale and automation for efficiency in the organisational management practice implement as quantum computer-operationalised procedures that scale on demand.

7.1.3 Mathematical-analytical preview for organisational management practice demands

Researcher considers mathematical-analytical preview for organisational management practice demands for scaling interpretative methodologies instrumentation from critical and typical to the enterprise level. Appendix B and Appendix C outline mathematical-analytical preview to scale from the critical and typical to the enterprise level.

Extensibility of instrumentation research design from manual towards automated procedures is required for organisational practice management to control and intervene behaviour in organisational context efficiently.

Mathematical-analytical preview for organisational management practice demands base on action research theoretic and logic reasoning processes considering theory development as practical without the immediate need of empirical case perceptual evidence (Festinger, 1962; Morvan and O'Connor, 2017).

Identification of individuals showing the absence of behaviours considered essential for organisational success is essential. This thesis methodology qualifies for the hiring of personnel, staff assignment and staff promotion decision making. Scaling this thesis methodology to imperative controls automate bias-free hiring of personnel, staff assignment and staff promotion by unbiased economic measurement of creative capabilities.

Future research must substitute simple patterns for desired or undesired behaviour in projects with complex behavioural patterns, a.k.a. Organisational sciences power law (Wang and von Tunzelmann, 2000). One organisational power law that directly threatens organisational success and organisational competitiveness by behaviour is the power law of circles of mediocrity (Masuch, 1985). The power law of circles of mediocrity is an example of complex pathological communication patterns defining parameters of psychotic organisational cultures diminishing organisational competitiveness.

Complex organisational psychotic patterns expose in the macroscopic dimension of social systems (Wallace et al., 2010; Conte et al., 2009). Organizational competitiveness and survival depend on the availability of bias-free systems recognising an individual, organisational members, and groups made up of such individual as primitive quantity of crucial cognitive propensities for the build-up of psychotic organisational cultures (Wallace et al., 2010; Masuch, 1985). Early detection of those crucial cognitive propensities is achieved by engaging quantum computer technology. This emerging methodology combines the scientifically proven “quantum-like” (Nielsen and Chuang, 2010) algorithms for “quantum hypotheses testing” (Belavkin, 1975) with selected conventional statistical procedures (Conte et al., 2009).

It is critical to port those procedures to operate quantum computer applications, understood and used by practitioner. Further integration work of porting those algorithms into quantum computer executable standard operating procedures are required to switch bias-prone managerial authoritarian control towards bias-free technological control (Edwards, 1981, cited in Barker, 1993).

Automated setup, execution and continuing quantum decision-making analytics are required to speed up the current manual “ideal speech” (Habermas, 2002; Habermas, 1987a; Habermas, 1990) operational procedures. Automation will be required to address the wicked problem (Stubbart, 1987, cited in Pearson, Clair, 1998, p. 62) of human uncertainty in real-time and on an enterprise scale.

7.1.4 Later acceptance and implementation approval by IBM.

The credibility of this thesis experimental action research inquiry is achieved by two plausibility tests and two experiments researching the process of the action leading to additional plausibility tests and plausibility testing phases.

This thesis methodology was implemented as quantum cognition experimentation on an IBM quantum computer. Four additional plausibility tests resulted from the quantum cognition project on IBM’s superconducting gate-model quantum computer.

The first action was to design and propose four experiments, two for quantum economics and two for general business management. For transformation from this thesis quantum cognition models were executed per researcher as manual spreadsheet calculations into the quantum cognition gate-models executed on quantum computer circuits. IBM quantum computing research scientist conceived the probability of executing these thesis quantum mechanical algorithms on IBM's gate-model quantum computer as reasonable aimed to evidence quantum computing supremacy. After IBM's review of the experimental design, research questions, quantum mechanical equations and business advantages were proposed. All four proposed experiments were given a six months dedicated quantum cognition project space with 24/7 priority access to IBM's experimental 20, 16, and five qubits gate-model quantum computer.

Acceptance of the proposed course of action established this first plausibility testing phase success. The second plausibility testing phase launched by the implementation action and researching the process of this implementation action. Experimental data gathered indicate that this thesis combination of qualitative action methods and quantitative quantum mechanical equations transform from manual models into executable quantum algorithm on gate model quantum computer with superconducting artificial atom hardware (IBM, 2018). The completed research is the subject of upcoming publications.

7.2 Limitations

As the quantum computer was not generally available during the experimental plausibility testing in 2016 are this thesis empirical cases limited to deductive mathematical-analytical proof. Mathematical-analytical empirical proof requires translation into quantum computer operationalised procedures once the quantum computer generally becomes available. Mainstream action research lacks the domain knowledge to build this empirical case.

As this research relies on non-quantum data collection technology and non-quantum data analysis methodologies for its findings, a generalisation of results is limited to questionnaires. This study's experiment restricts to short-term experimental questionnaire-driven data collection leading to the limitation that virtuality has only been studied in its effectiveness for anonymisation and not its full contribution to establish and maintain an

“ideal speech situation” (Habermas, 2002; Habermas, 1987a; Habermas, 1990). This study reasoned that quantum augmented reality and mathematical-logical tools deliver new rational forecasts explaining data more complete than conventional mainstream models (Bruza et al., 2009; Aerts and de Bianchi, 2015; Franco, 2007).

For the determinations of this thesis, the researcher focused on the general transferability of accurate, scientific experimental, quantifiable research results. The empirical case transformed into a theoretical model of practical relevance as a valuable starting point until new empirical cases surface.

7.3 Summary

This study provides plausible credibility for a scientifically rigorous action-science methodology, establishing a subject-bias-free method for communication in an organisational context. This thesis methodology predefines patterns for bias-free data collection and bias-free analysis, applying a framework of the interference pattern as the start-up assumption upon which valid conclusions are drawn.

Future research shall commit using this start-up assumption into action research instrumentation to meet the scale, scope and practicality requirements for action control.

7.3.1 Scope

The method of transformation by rotating along coordinates and the manual process to visualise as angular momentum in this thesis (figure 27; figure 28; figure 29) requires future action research to increase the quantity, quality and variety of data collected and analysed.

Continuing experimentation shall increase the number of coefficients computed in the interference pattern. This increases the number of changing values of the coefficients. An increase in the number of changed values increases noise, which in turn increases the understanding of the impact of this noise expressed in the interference pattern. Therefore, this separates the noise from the interference of interest leading to a focused, critical density of the interference variable examined.

7.3.2 Scale

Scale establish critical density by collecting all variables and all coefficients of interest in a single superposition. This single superposition state shall permit parallel access to all variables and coefficients to specify the weighting of each variable and each coefficient. This increases significantly the probability of identifying a state corresponding to the magnitude squared of one of the coefficients in this single superposition state.

The interference equations (figure 30; figure 31), explaining and forecasting observable behaviour per participant (figure 33) and the method for determining the dominating mindset (DS) (figure 1; figure 27; figure 28; figure 29) for agreed on behaviour requires future action research to increase in critical density.

Increased critical density will harness the myriad of communicative interaction of actors until the dominating mindset (DS) (figure 1; figure 27; figure 28; figure 29) and forecasting observable behaviour per participant (figure 33; figure 30; figure 31) in the specific organisational context observed emerges. Thus, future action research can extend this thesis superposition state from 4-dimensional TIspace (figure 15; figure 16) with 16 states, into 20-dimensional TIspace and 50-dimensional TIspace. This will permit action research on 20-dimensional TIspace to use up to 400 variables (20^2) allowing to simultaneously manipulate and change the values of up to 1,048,576 (2^{20}) weighting coefficients. In the future, it will be possible to utilise 50-dimensional TIspace to use up to 2500 variables (50^2) allowing to simultaneously manipulate and change the values of up to 1,125,899,906,842,624 (2^{50}) weighting coefficients.

7.3.3 Practicality

Future enhancements of the methodology in this thesis based on scope and scale will focus on practical applications and the impact on business or societal problems. Scope and scale increased knowledge must lead to actionable knowledge. Actionable knowledge should engage policy-makers, organisational management, and action researchers. Increased understanding of communicative action prompts awareness to engage in controlling and intervening action to steer behaviour in the desired direction.

Controlling and steering of communicative action by organisational management requires implementation scenarios without the need for additional resources. The need for additional resources, either with more computation hardware or time to reliably proof and verify the claimed findings, increase the financial commitment. This increases the risk of senior management sanctioning the proposed course of action.

7.3.4 Actionable knowledge

Future research parallelism considers all communicative action at once, which enhances the model of measuring distinct systems in their original amplitudes. This is from a non-entangled composite state of observables into amplitude measures of one entangled state in one system (Williams, 2011). Future scope and scale increase of communicative action mirror communicative actions in parallel. Subject-bias free communication establishes

within the input of the superposition state. Future research methodology enhancements on processing bias-free communicative action within the input of superposition state of all communicative action, result in control while auditing at the quantum scale.

7.3.5 Automation

To avoid the need for more hardware or more time future research can extend the method for transformation in this thesis by rotating along coordinates and automating the manual process to compute the angular momentum (figure 27; figure 28; figure 29).

7.3.6 To avoid more time

Control while auditing is practically useable. Forthcoming experimentation shall keep the time difference between detection of undesirable behaviour and delivery of control and steering action for behaviour in the desired direction near real-time, based and dependent on system detected severity levels.

Future research automation of simultaneous audit and control of up to 1,125,899,906,842,624 (2^{50}) weighting coefficients cannot calculate on a classical computer without adding substantially more time. Thus, future quantum algorithms design for quantum computing hardware relieves action researchers from manual and time-consuming bias-detection analysis procedures.

7.3.7 To avoid more hardware

Future research automation of simultaneous audit and control of up to 1,125,899,906,842,624 (2^{50}) weighting coefficients cannot calculate on a classical computer without adding substantially more hardware and costs.

Future action research data collection and analytics require extending the methodology in this thesis to read out, re-initialise and reset all values of weighting coefficients within the ongoing transformation along such coordinates as angular momentum (figure 27; figure 28; figure 29). Thus, future experimentation shall port the specification for transformation by

rotating along coordinates (figure 27; figure 28; figure 29) onto superconducting or spintronic or optical spin-flips, naturally occurring in electronic or phosphorus or nuclear spin phenomena (Williams, 2011).

All three action research challenges, defined as scale, scope and practicality establish quantum logic and entanglement. This logic permits transforming the methodology from disciplinary knowledge into actionable knowledge.

Appendix A: CAMES quantum mathematical formalism

8.1 Proving empirical transferability and methodological universality

To emphasise the practicability of this action science strategy are below explanations simplified, treating the semantic space as only 4-dimensional and as a real vector space.

8.2 CAMES TI_{space}

8.2.1 Determination of an organisational member's preferences to act during the experiment

CAMES TI_{space} adds prediction of unnoticed activities to prediction of observable behaviour (Lorenz, 2007; Searle, 2007). Theoretical abstractions augment the empirical domain. Both, the mathematical abstraction of the unnoticed activities and the observable empirical behaviour result in conceptual practicality. Conceptual practicality establishes a conceptual generality. Conceptual generality transforms theories about theories into actionable research metatheories (Morvan and O'Connor, 2017).

$$IA_{D|B} = Prb_D \cdot DM(t) \cdot IA_B$$

Figure 30 Determination of new superposition – a forecast of observables rendered by mathematical abstraction

In case of the researcher's work-related problem represents CAMES TI_{space} conceptual practicality to predict project member behaviour beyond the point the participant answered the questionnaire. This conceptual practicality establishes conceptual, general independence from direct observables (figure 30).

8.3 Probability a project participant and organisational member acts 'defensive' after the questionnaire

CAMES considers underlying motivations as forces driving the behaviour of project participants and organisational members. Such forces act in opposition to the project and organisational member. Forces are acting in opposition cause inconsistent behaviours exposed as observable cognitive dissonance (Festinger, 1962). CAMES TI_{space} collects observable, and non-observable dissonance project member expose. CAMES is action-theoretical metatheory (Heracleous and Barrett, 2001).

In the case of the researcher's work-related problem allows CAMES TI_{space} to predict project member behaviour beyond the point in time the participant answered the questionnaire.

$$\begin{aligned}\widehat{Prb}(D) &= |KPI_D * U(t) * (ia_G * IA_G + ia_B * IA_B)|^2 = |ia_G \cdot (KPI_D \cdot U(t) \cdot IA_G) + ia_B \cdot (KPI_D \cdot U(t) \cdot P_B)|^2 = \\ &= |ia_G \cdot IA_{D|G} + ia_B \cdot IA_{D|B}|^2 = |ia_G \cdot IA_{D|G}|^2 + |ia_B \cdot IA_{D|B}|^2 + 2 \cdot |ia_G \cdot ia_B \cdot (IA_{D|G}^\dagger \cdot IA_{D|B})| \cdot \cos(DM) \\ &= p_G \cdot \widehat{Prb}(D|G) + p_B \cdot \widehat{Prb}(D|B) + 2 \cdot |ia_G \cdot ia_B \cdot (IA_{D|G}^\dagger \cdot IA_{D|B})| \cdot \cos(DM)\end{aligned}$$

Figure 31 Probability a project participant and organisational member acts 'defensive.'

$$\widehat{Prb}(D|B) = |KPI_D \cdot TIR - Vix2 \cdot t \cdot adn \cdot IA_B|^2$$

Figure 32 Measuring participants' preferences to act

Stereotype most liked rank	Research question	Judgement 1 & 2				Judgment 3		Judgment 3		Judgement 3		Judgement 3	
		FPT(G)	FPT(D/G)	FPT(D/B)	FPT(B)	TIEO, FPT, DM	Variance between FPT(B) and FPT(D)	TIEO, FPT, DM	FTP(D) "Definitely No"	FTP(D) Probably "No"	FTP(D) "Not sure"		
1	1	90	70	10	10	20.00	10.00	20.00	10	0	10		
4	2	10	0	0	90	90.00	0.00	90.00	10	50	30		
3	3	60	10	30	40	50.00	10.00	50.00	0	20	30		
4	4	20	0	0	80	90.00	10.00	90.00	10	50	30		
2	5	70	50	30	30	20.00	-10.00	20.00	0	0	20		

Figure 33 Interference arise from measurement

CAMES combines mathematical abstraction of the non-observable behaviour (figure 30) and forces acting in opposition on the project member (figure 31). CAMES permits interference effects to arise from measurements.

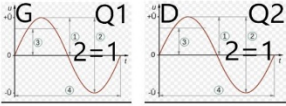
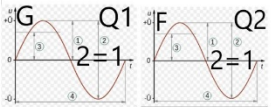
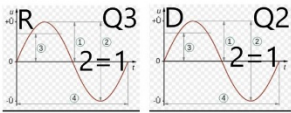
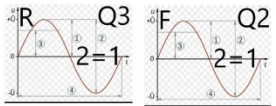
	$ G,D\rangle$	$ G,F\rangle$	$ B,D\rangle$	$ B,F\rangle$
$q_{GD}^{(0)}$				
$q_{GF}^{(0)}$				
$q_{BD}^{(0)}$				
$q_{BF}^{(0)}$				

Figure 34 KPI magnitude baseline.

If	then	If	then	desirable communication competence measures				
$IA_I = IA_G$	$ia_{GD}^{(0)} = 1$	$IA_I = IA_B$	$ia_{GD}^{(0)} = 0$	$IA_F = U(t) * IA_I$	$ia_{GD}^{(0)} = 1$	$ia_{GD}^{(0)} = 1$		
	$ia_{GF}^{(0)} = 1$		$ia_{GF}^{(0)} = 0$		$ia_{GF}^{(0)} = 1$	$ia_{GF}^{(0)} = 0$		
	$ia_{BD}^{(0)} = 0$		$ia_{BD}^{(0)} = 1$		$ia_{BD}^{(0)} = 0$	$ia_{BD}^{(0)} = 1$		
	$ia_{BF}^{(0)} = 0$		$ia_{BF}^{(0)} = 1$		$ia_{BF}^{(0)} = 0$	$ia_{BF}^{(0)} = 0$		

Figure 35 KPI meaningful measures.

8.3.1 Judgement 1 and judgement 2

Participants intention to act is subject of re-evaluation over time $KPI_D \cdot U(t)$ (figure 31).

8.3.1.1 Measuring preferences to act

Judgement 1 determines the first quantum mathematical two-factor communication competence eigenvalue measure (Busemeyer, Wang, and Lambert-Mogiliansky, 2009; Henderson, 2008). Judgement 1 measures participants' preferences to act for research question stereotypes 1, 2, 3, 4, and 5.

8.3.1.2 Measuring action decision

Judgement 2 determines the second quantum mathematical two-factor communication competence eigenvalue measure (Busemeyer, Wang, and Lambert-Mogiliansky, 2009; Henderson, 2008). Judgement 2 measures participants' action decision for research question stereotypes 1, 2, 3, 4, and 5.

8.3.2 Judgement 3

Judgement 3 determines a third quantum mathematical five-factor communication competence eigenvalue measure (Denolf, 2017). Judgement 3 measures participants' action decision and measures participants' preferences to act for research question stereotypes 1, 2, 3, 4, and 5.

Judgement 3 measure variances by interference patterns (figure 30; figure 31). Variances measure changing action preferences (figure 30). Interference measurements (figure 32) determine the participant's beliefs and preferences over time (figure 31). Judgement 3 entangles beliefs and preferences by intentionally induced interference. Judgement 3 actively generates interference $+ 2 \cdot |i a_G \cdot i a_B \cdot (I A_{D|G}^\dagger \cdot I A_{D|B})| \cdot \cos(DM) \neq 0$ (figure 31) vs passively observing for re-measuring the probability to act non-desirable "defensive". Entangling beliefs and preferences generate interference for re-measuring the participants' action probability (Ashtiani and Azgomi, 2016). The participant is forced into conflict and dissonance for the judgement that had been inquired three times during the experiment (Denolf, 2017).

The probability of participant's action defines by superposition amplitudes of all action decisions in judgement 2 and 3 (figure 34; figure 35). The resulting discrepancy of probability calculation between judgement 1 and judgement 2 and judgement 1 and judgement 3 computes by squaring magnitudes of amplitudes (Figure 30; Figure 31) (Halliwell, 2008; Busemeyer, Wang, and Lambert-Mogiliansky, 2009).

The table (figure 33) is conditioned on amplitudes in superposition across all three judgements (Busemeyer, Wang, and Lambert-Mogiliansky, 2009). CAMES considers all responses without adjusting any result, interference and measurement of observed project member dissonances.

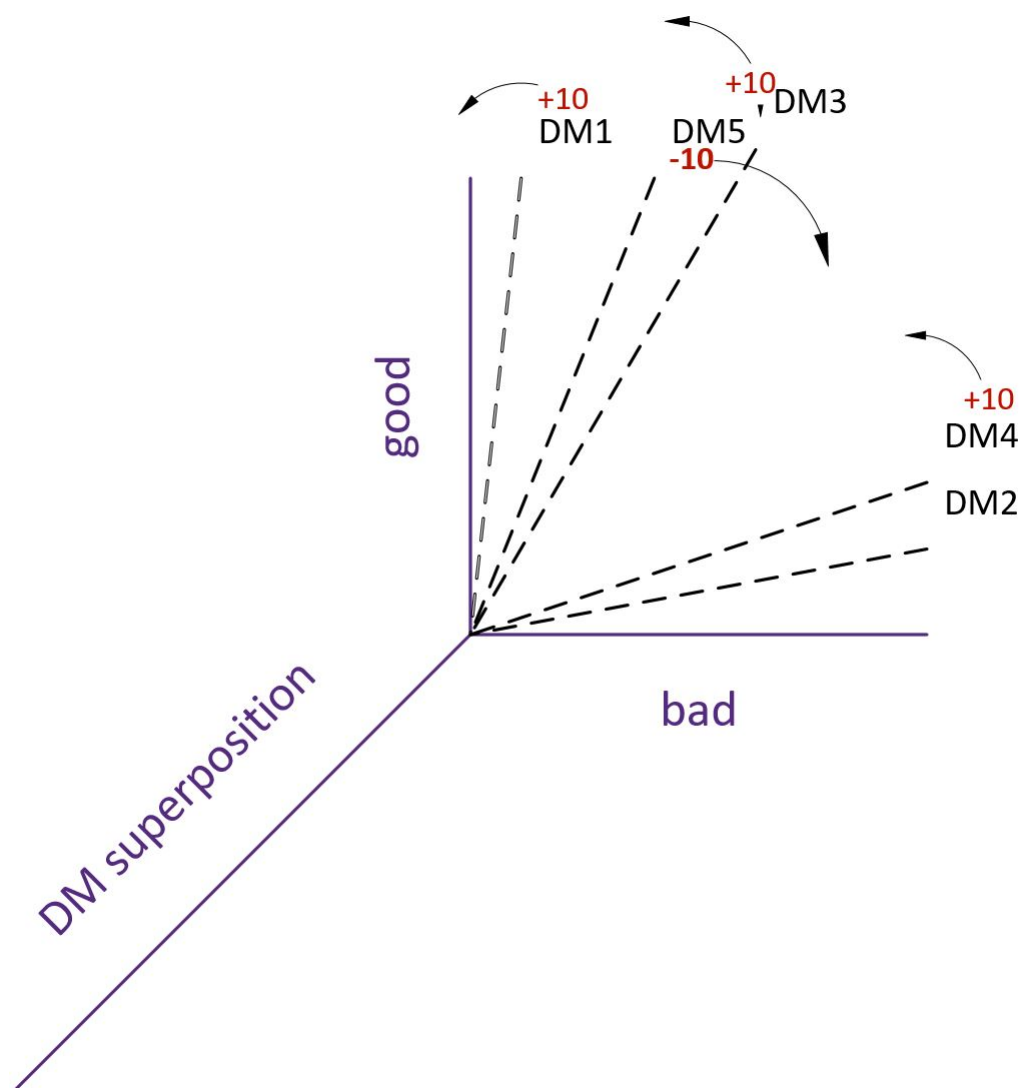


Figure 36 ($IA_{D|G}^+ \cdot IA_{D|B} \neq 0$) for research question stereotypes 1, 3, 4, and 5.

Four narrative stereotype perceptions are in dissonance and non-orthogonal (Festinger, 1962; Busemeyer, Wang, and Lambert-Mogiliansky, 2009; Henderson, 2008). Variances between FPT(B) and FTP(D) (figure 30) result in non-orthogonal $IA_{D|G}^+ \cdot IA_{D|B} \neq 0$ (figure 36) for research question stereotypes 1, 3, 4, and 5 (figure 36). Only judgement 3 scaling and quantised spin achieve readjustment of non-orthogonal elements into diagonals equal to one (figure34; figure35) (Denolf, 2017; Aerts, Broekaert and Smets, 1999).

The variance enters as DM (figure 1) into CAMES interference equations (figure 30; figure 31), explaining and forecasting observable behaviour per participant (figure 33).

In the case of the researcher's work-related problem allows CAMES to predict project member behaviour beyond the point in time participant answered the questionnaire (Halliwell, 2008).

8.3.3 The equation to generate missing data

Dissonance creates interferences across judgements and actions (Denolf, 2017). Judgement 1 and Judgement 2 data collection from experiment participants miss FPT(F/G) (figure 1; figure 33). Judgement 3 scaling and quantised spin results in generating unnoticed activities.

$$|ia_G|^2, |TIEO_{DG}|^2, \cos(DM)$$

Figure 37 Parameters to generate missing data

$$|TIEO_{fg}|^2 = 1 - |TIEO_{dg}|^2 = |TIEO_{db}|^2 \rightarrow FPT(D|G), FPT(D|B) FPT(D), FPT(G), \cos(DM)$$

Figure 38 Equation to generate missing data

Readjustments of non-orthogonal elements into diagonals equal to one and readjustments of off-diagonal elements equal to zero (figure 34; figure 35; figure 36) introduce a third outcome vector. This third outcome vector is Pr(D).

Judgement 3 third outcome vector Pr(D) completes the equation to generate the missing data FPT(F/G) (figure 38), augmenting observed behaviour by unnoticed activities with mathematical certainty (figure 37).

Judgement 3 introduces new interferences. Judgement 3 variance measures of observed cognitive dissonance enter as dynamic momentum (DM) (figure 1) the probability determination if the experiment participants act 'defensive'. The Judgement 3 variance set the value for DM.

The actual participant responses explains by the framework of quantum mechanics but violate the law of total probability as there is no 100% resolution for all data resulting from measures. Judgement 3 measures exceed any statistical average calculations by expanding Hilbert space with interference measures vs discarding such as noise, e.g. for the defensive

good and defensive bad $IA_{D|G}^+ \cdot IA_{D|B} \neq 0$ (figure 36). The variances measured in judgement 3 produce $FPT(D)$, generate $FPT(F/G)$ (figure 38), augmenting observed behaviour by unnoticed activities with mathematical certainty (figure 37) and predict project member behaviour beyond the point in time participant answered the questionnaire (Halliwell, 2008).

Appendix B: CAMES Basic algorithm

9.1 Introduction

Appendix A and the thesis emphasised the practicality of this thesis action science strategy. Research questions R1, R2, R3 and R4 experimentally verified in their practicality for typical and critical researcher work situations. Appendix B is a preview of the next action research steps.

Judgement 3 generates missing data FPT(F/G) (figure 1; figure 33) and FTP(D) (figure 38). Judgment 3 scaling and quantised spin result in generating unnoticed activities (figure 12) (Porzel and Gurevych, 2003). In the case of the researcher's work-related problem allows CAMES TI_{space} to predict project member behaviour beyond the point in time the participant answered the questionnaire (Halliwell, 2008).

Future research requires that complex amplitudes fit complex data (Busemeyer, Wang and Lambert-Mogiliansky, 2009). In the case of the researcher's work-related problem predict project member behaviour according to power laws and without the need for participants to respond to a questionnaire (Atmanspacher, Filk and Römer, 2004).

9.2 Mathematical-analytical preview for next action research cycle

$$Prb_{(D)} = \left(\frac{10}{00} \right) \text{ and } Prb_{(M)} = \left(\frac{\cos^2 DM}{\cos DM \sin DM} \frac{\cos DM \sin DM}{\sin^2 DM} \right)$$

Figure 39 Definition of outcome vector "vicious circles of mediocracy" (Masuch, 1985)

Scaling CAMES from selected critical and typical usage scenarios to usage scenarios across the enterprise requires extensions of simple patterns for desired or undesired behaviour in projects with complex behavioural patterns for desired or undesired behaviour in organisations, a.k.a. Organisational sciences power laws (Wang and von Tunzelmann, 2000). A variety of complex pathological communication patterns defined as power laws exist (Anderson, 1999; Maguire et al., 2006; Vitiello, 2012). The equation for extension of this thesis simple patterns exemplifies by the power law of vicious circles of mediocracy resulting in psychotic organisational cultures diminishing organisational competitiveness (Masuch, 1985).

Language is subject of CAMES analysis according to schemas from, Chomsky (1957), Habermas (2002; 1987a; 1990), Wittgenstein (2013) and Michalos (1970), resulting in simple language encoding schemas, e.g. pure ‘good’ or ‘bad’; applicable to the computational base 0, 1.

9.3 Complex behavioural pattern and new experimental situation

$$Prb_{(D)} + Prb_{(M)} = \left(\frac{1 + \cos^2 DM}{\cos DM \sin DM} \frac{\cos DM \sin DM}{\sin^2 DM} \right)$$

Figure 40 Different Hilbert spaces model for a complex behavioural pattern and new experimental situation (Denolf, 2017)

Measuring participants’ preferences to act (figure 32) and determining the probability a project participant and organisational member acting undesirable, e.g. As ‘defensive’ (figure 31) extends to complex behavioural pattern and environmental influences as defined narrative in the power law of “vicious circles of mediocracy” (Masuch, 1985) (figure 40). Every communicative action influences (figure 32) the associated measurement aimed to the early detect build-up of “vicious circles of mediocracy” (Masuch, 1985) (figure 40).

Appendix C: CAMES logograms

10.1 Introduction

Mathematical-analytical preview for next action research cycle and next steps extension of CAMES require control of behaviour in real-time and across the enterprise. Organisational management requires control and intervention opportunities to steer behaviour in projects or organisational context in the desired direction (Dutton and Ashford, 1993).

10.2 CAMES notation (Non-Linear Orthography Logograms (CNLOL))

CAMES provides formal methods to analyse organisational, communicative actions via computer operational algorithms representing patterns of pathological, distorted communication, and organisational power laws targeting human failures and deficiencies.

Logograms depict translation of language, utterances, actions (figure 31; figure 33) and corresponding organisational sciences power-law patterns (figure 40) into control and steering patterns. Such patterns depict as quantum algorithm blueprints, a.k.a. Logograms.

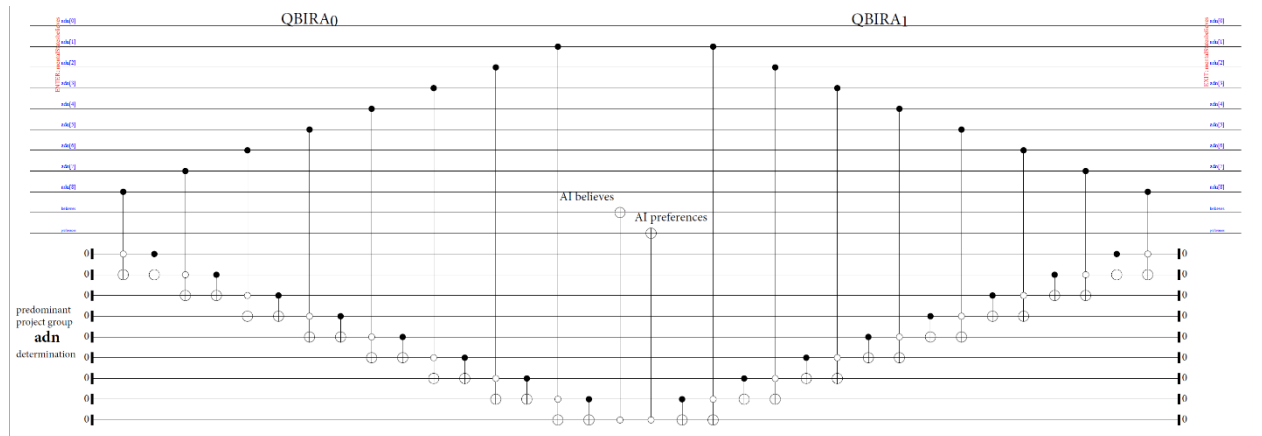


Figure 41 CAMES logogram mentalstatebelieves

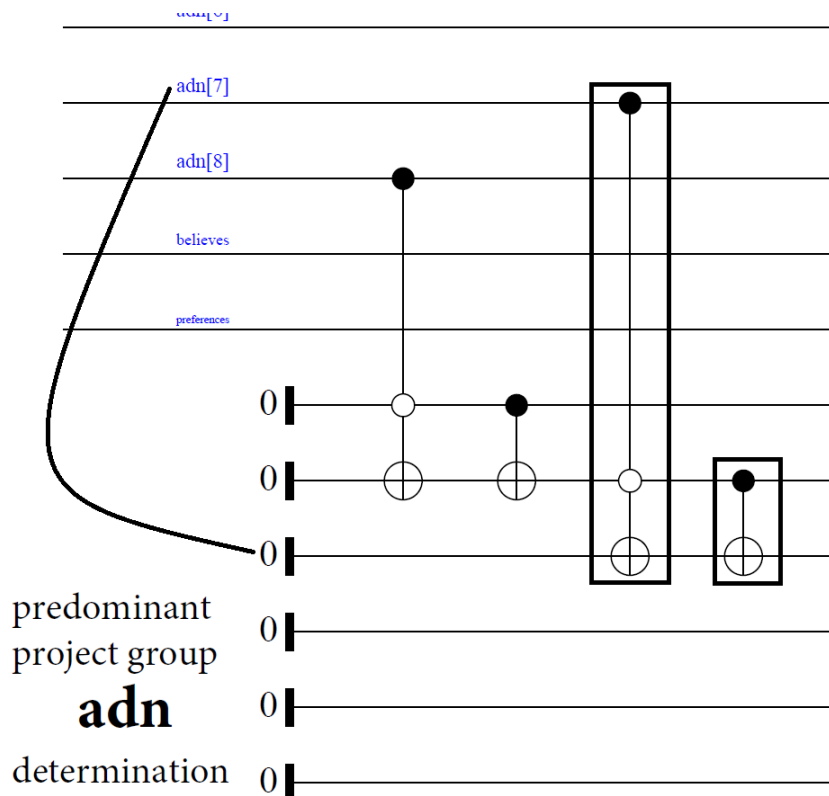


Figure 42 CAMES logogram mentalstatebelieves

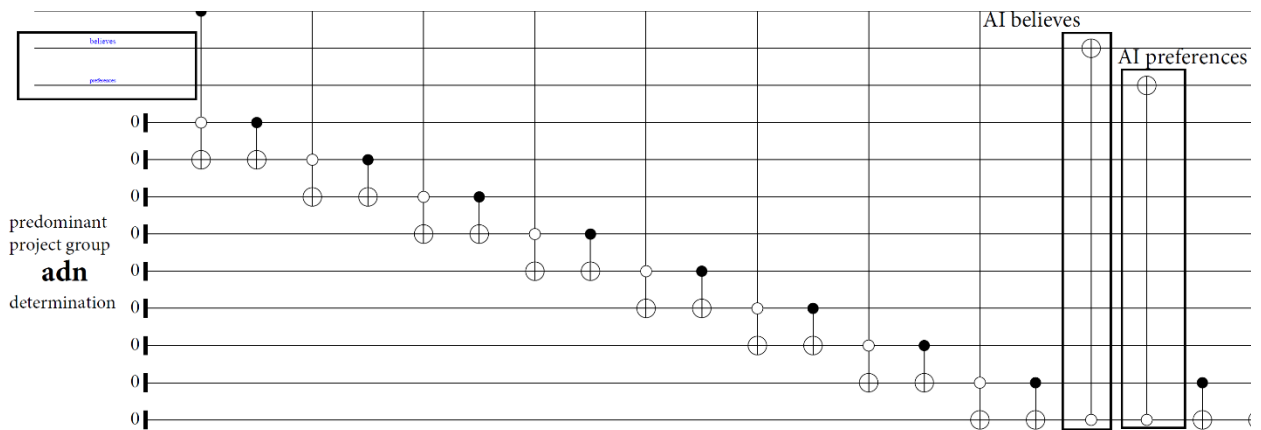


Figure 43 CAMES logogram mentalstatebelieves

Logograms are research patterns instructing transient teams of action scientist, action researcher, practitioner, quantum circuit developer and organisational management in transforming the mathematical-analytical equations into computer operational imperative controls for strategic human resource steering initiatives, e.g. As quantum gates (figure 41).

Gates represent work on data and depict as squares (figure 42). A selection of data that held in storage areas depicts as horizontal lines, known as qubits (figure 41; figure 42; figure 43).

Controls are connections between gates (figure 43; figure 44) and define data superposition, and other precision optimised methods magnifying the relevant and blending out the irrelevant. These connections between gates (figure 43; figure 44) and data are the next step to move on from the mathematical-analytical singletons of action science and action research into practical, mass scale and more precise action science and action research methods. Most logograms include reversibility by default depicted as left and right side of logograms being identical (figure 41).

10.3 Sample control and change patterns future research shall investigate in their practicality further

The next set of CAMES CNLOL (figure 41, figure 42, figure 43) applies Habermasian categories, to a multi-dimensional quantum modelling in a virtual communication setup.

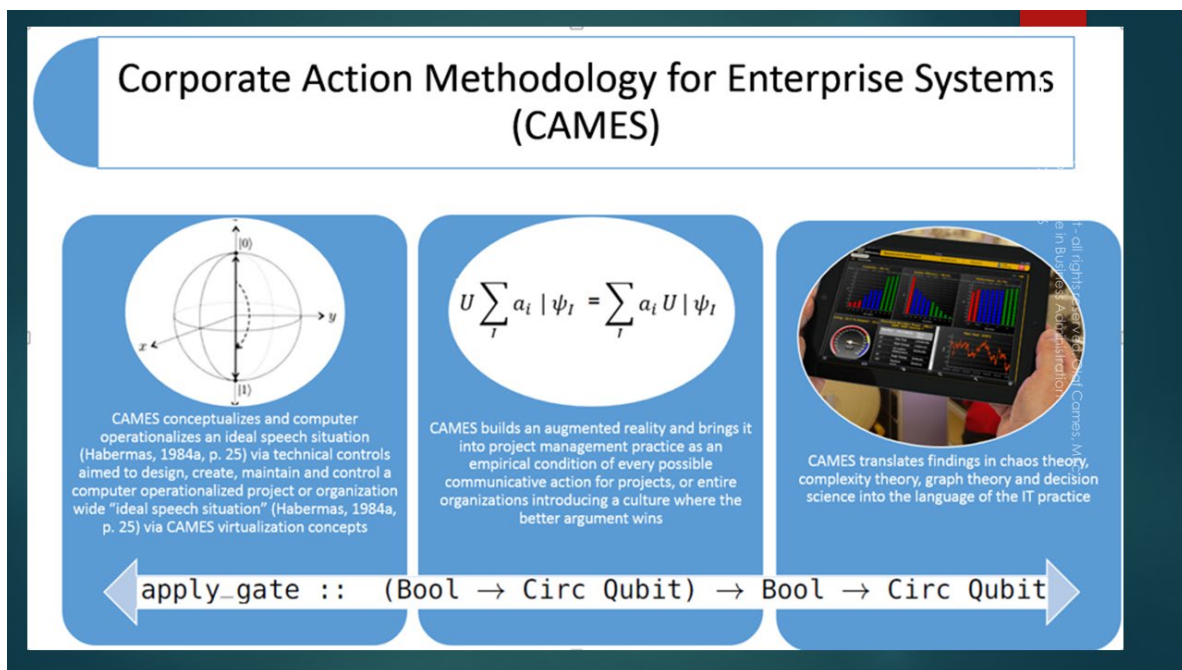


Figure 44 CAMES concept (Smith and Cames, 2016; Cames and Smith, 2015a; Cames and Smith, 2015b; Cames and Smith, 2015c)

Reciprocal expectations of observed understood, acknowledged and recognised attitudes, desires, needs (adn_π; figure 1) in CAMES virtualised ideal speech situations (figure 44) are subject of subjective data collection. Subjective data sources from common communication tools applied in today's virtualised project environments, e.g. Microsoft Office 365 and chat applications e.t.c.

The CAMES Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) breaks down ordinary language communication between nine discussers into measurable objectifying attitude (Habermas, 2002; Habermas, 1987a). CAMES Logogram: mentalStatesbelieves measure “believe” by category symbolic (Busemeyer, 2009; Townsend et al., 2000). CAMES Logogram: mentalStatesbelieves measures action preference by action symbolic (Busemeyer, 2009; Townsend et al., 2000). These measuring procedures act on beliefs and preference qubits, detect and collect observed changes in action preferences and are an action researcher’s tool to alter category “beliefs”.

As this performs in an ancilla (figure 2) occurs no breakdown of unitary evolution. Researcher introduced interferences to ongoing communication occur as an intentionally induced virtualised Habermasian ideal speech setup. Habermasian information theoretical understanding of communicative action is a superposition of either communicative or strategic action (Habermas, 2002). This strategic action meets Busemeyer’s 4-dimensional quantum modelling factor “task payoffs” (Busemeyer, 2009).

CAMES logogram and underlying algorithms adopt scientific findings that Hamiltonian are capable of measuring equal probabilities and adopts Habermasian pragmatics stating that action is either communicative or strategic (Habermas, 2002; Busemeyer, 2009). CAMES Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) establishes repeatable, verifiable structure to register communicative and strategic behaviour as states, like 1 or 0. Repeatable, verifiable structure establishes a register as a methodological tool to track communicative action evolvments over time by recording any state between 1 and 0. CAMES notation Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) flip-detect VI attitudes, desires, needs (adn_n ; figure 1) onto ancilla (figure 2). By using ancillas, no interferences of researcher analytics on participants occur meeting wave collapse avoidance principles in quantum mechanics.

10.4 Additional predecessor added

That additional ancilla perform further precision refinements by placing the most likely as an initial condition to create new superposition operations. Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) is, therefore, a machine learning quantum algorithm with

increasing precision. This constant refinement and ever-increasing precision results in machine capabilities considered requiring human intelligence. Artificial intelligence learning capabilities are intrinsic to CAMES notation Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43).

Beginning with qubit labelled adn_7 (figure 1; figure 42), opposing flips (superposition) of predecessor ancilla, plus flip (superposition) of participant observed adn (attitudes, desires, needs; figure 1) are performed. The results store via the CAMES logogram mentalstatebelieves ancilla qubits to mirror participant measured attitudes, needs and desires (attitudes, desires, needs; figure 1). CAMES logogram mentalstatebelieves (figure 41, figure 42, figure 43) repetitive pattern applied across all participants ensures complete coverage of CAMES ideal speech situation in a short amount of time and with little resource consumption.

This qualifies CAMES notation Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) to act on any size of project teams, e.g. for enterprise project management offices, for organisational 24/7 and non-stop enterprise systems in global scenarios given the decision problems are kept in upper bound polynomial complexity, meeting class P and NP prerequisites (Nielsen and Chuang, 2010).

10.5 Sample control and change patterns future research shall investigate in their practicality

Believes are values that always come before actions and lead to rotations favouring a specific action (Busemeyer, 2009). This order of events meets Habermasian concepts of intentionality and consciousness that can be identified as wish, opinion, and expectation in sentences (Habermas, 2002).

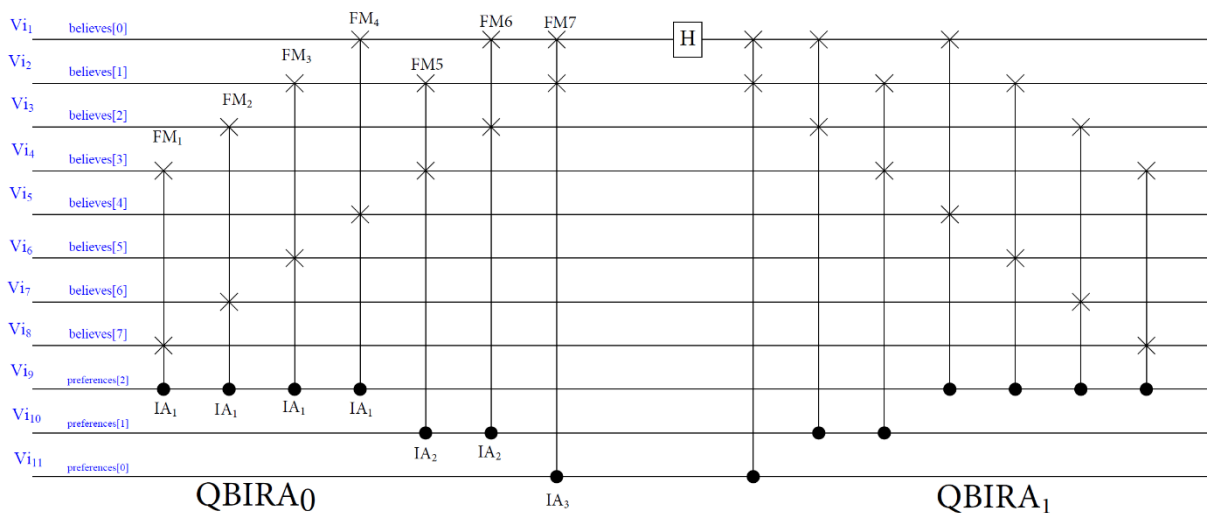


Figure 45 CAMES logogram mentalstatebelievespreferences

Meaning is therefore directly objectified as quantum mechanics quantification of rotation and superposition of states (figure 36) depicted in CAMES Notation Logograms, e.g. CAMES notation Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) and CAMES logogram mentalstatebelievespreferences (figure 45), as findings of beliefs.

Matching believes of at least two CAMES virtualised ideal speech participants is required to trigger the detection of a vicious circle of mediocrity (Masuch, 1985) (figure 39; figure 40) via CAMES logogram mentalstatebelievespreferences (figure 45). Once beliefs of at least two participants identify via procedures executed by CAMES logogram mentalstatebelievespreferences (figure 45) in sentences as emerging tendencies of project goal diverging interests the observation of such a motion towards formation will lead to preference determination.

10.6 Substitute failing humans by artificial intelligence tools

Both depicted CAMES logogram, CAMES notation Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) and CAMES notation Logogram: mentalstatebelievespreferences (figure 45) serve future research in exploring augmented or artificial intelligence tools to either assist project management or to substitute failing humans as project manager in early detection of “vicious circle of mediocrity” (Masuch, 1985).

Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) and CAMES notation
 Logogram: mentalstatebelievespreferences (figure 45), execute as machine learning
 augmented artificial intelligence. Machine learning optimisation surpasses human
 capabilities in scientific rigour application of methodological structure for identifying and
 triggering well-timed countermeasures. Machine learning augmented and artificial
 intelligence act before issues develop and before culminating into less competitive
 capabilities for the project or organisation as a whole. For practitioner will a 2-dimensional
 alert (figure 44) augment their reality to timely respond and act with countermeasures to
 avoid detrimental effects to the project or the organisation as a whole. For the contribution
 to action science, knowledge will patterned detection of mediocrity coalitions lead to
 systematics (Masuch, 1985).

Logogram: mentalStatesbelieves (figure 41, figure 42, figure 43) and CAMES notation
 Logogram: mentalstatebelievespreferences (figure 45) transition macro-level detection of
 mediocrity coalitions into micro-level mediocracy manifestations (Masuch, 1985). Such micro-
 level manifestations will refine machine-learned logograms in their ability to act early on
 sooner achieved pattern detection of the always present quantum-like non-linear system.
 The latter again be used by practitioners as computer operational procedures addressing the
 wicked problem (Stubbart, 1987, cited in Pearson and Clair, 1998) on a global and real-time
 scale.

An ever-increasing precision is a result and established during the passage of time CAMES
 logogram mentalstatebelievespreferences (figure 45) runs. Adding of states culminate in
 producing a superposition of the predominant project group adn (attitudes, needs and
 desires; figure 1) and are delivered to qubit 'believe' and qubit 'preference' (figure 45). This
 output will build the input for other Logograms. The pattern formed. Future research to pick
 from here.

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